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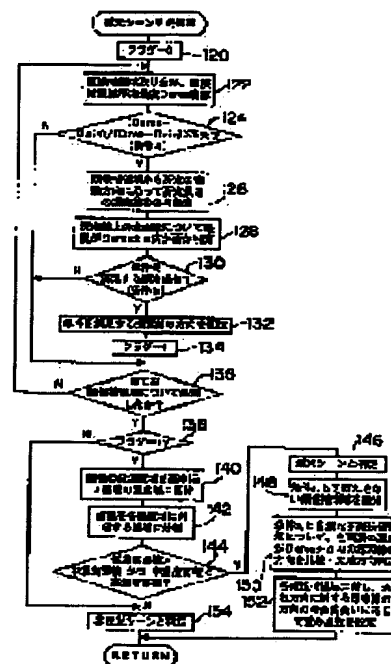
(72)Inventor : KANESHIRO NAOTO

## (54) IMAGE PROCESSING METHOD, IMAGE PROCESSOR AND RECORDING MEDIUM

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To decide an area corresponding to the face of a person with high accuracy even when the density of the area corresponding to the face of a person in an image is biased toward a high density side or a low density side.

**SOLUTION:** Search lines that radially extend from a face candidate area on an image are set to an area where density is biased toward a high density side (positive in 124) among face candidate areas estimated as corresponding to a human face and whether or not a search line consisting only of pixels whose difference from density Darea in the face candidate area is within  $\pm \Delta$  exist is decided (126 to 130). When a face candidate area meeting the condition exists, an image is divided into the area of each density area being high density/low density/intermediate density and whether or not the area of the intermediate density area is smaller than the areas of the other areas is decided (140 to 144). When the decision is positive, the image of a processing object is decided as the image of a backlight scene and accuracy as a face area of a backlight scene is evaluated to each face candidate area (146 to 152).



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CLAIMS

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[Claim(s)]

[Claim 1] Based on image data, considerable, then the face candidate field presumed are extracted to the face of the person in the picture which this image data expresses. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The image-processing method of evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation.

[Claim 2] When the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is more than a threshold of the above 1st The surface ratio of the field of each concentration region when dividing all the concentration regions of the aforementioned picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, and dividing the aforementioned picture into the field of each concentration region, And the image-processing method according to claim 1 characterized by taking into consideration and evaluating at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field on the aforementioned picture.

[Claim 3] When the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is below a threshold of the above 2nd The image-processing method according to claim 1 characterized by the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field taking into consideration and evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field on the aforementioned picture.

[Claim 4] The image processing system characterized by providing the following. Equivalent to a face, then an extraction means to extract the face candidate field presumed of the person in the picture which this image data expresses based on image data. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in

the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. An evaluation means to evaluate the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation.

[Claim 5] Equivalent to the face of the person in the picture which this image data expresses based on image data, then the 1st step which extracts the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on th existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The record medium with which the program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation was recorded.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

**[0001]**

[The technical field to which invention belongs] this invention relates to the image-processing method, an image processing system, and a record medium, and relates to the record medium with which the program for performing especially a person's image processing system which can apply [ considerable, then ] the image-processing method of extracting the field presumed, and this image-processing method to a face and aforementioned image-processing method in a picture by computer was recorded.

**[0002]**

[Description of the Prior Art] When admiring a person photograph, in carrying out exposure record (it records by field exposure or scanning exposure) of the subject-copy image which the part which attracts attention most is a person's face, for example, was recorded on the photographic film etc. to record material, such as printing paper Although it is desirable to control exposure so that the color and concentration of a face of a person may become proper, in order to realize this exposure control, it is necessary to detect correctly the tint and concentration of a field equivalent to the face of the person in a subject-copy image. moreover, in the various image processings developed for the purpose of the improvement in quality of image of the picture which this image data expresses, to the image data obtained by reading a picture Although there are some which perform specific image processings (for example, local concentration amendment, bloodshot-eyes correction, etc.) only to the field equivalent to the face of the person in a picture or its part, in order to perform this processing, it is necessary to detect correctly the position and size of a field equivalent to the face of the person in a picture.

**[0003]** For this reason, equivalent to the face of the person in a picture, then the technique for extracting the field presumed are variously proposed from before. For example, it is based on JP,8-184925,A at image data. a configuration pattern (for example, the profile of a head --) peculiar to each part of the person who exists in a picture It searches for any one of the configuration patterns showing the profile of a face, the internal structure of a face, the profil of a fuselage, etc. While setting up the field (candidate field) where the adjustment as a field equivalent to a person's face is high according to the physical relationship of the predetermined portion the person's [ whom the size of the detected configuration pattern, the sense, and the detected configuration pattern express ], and a person's face It looks for other different configuration patterns from the detected configuration pattern, the adjustment as a person's face of the candidate field set up previously is evaluated, and considerable, then the extraction method of a face field of extracting the field (face field) presumed are indicated by a person's face.

**[0004]** However, although the brightness (concentration) of the face field in a picture deflects the concentration of a face field to a high concentration (low brightness) side on the picture which changes greatly with lighting conditions over a person's face in the scene showing a picture, for example, expresses a backlight scene, it deflects the concentration of a face field to a low concentration (high brightness) side on the picture showing the scene which made the stroboscope emit light. By the conventional face field extraction method of extracting a face field

from a picture, when it was the picture as which it has the fault that the extraction precision of a face field falls sharply, for example, the picture of a processing object expresses a backlight scene as the concentration of a face field deflected each to the high concentration or low concentration side, it had occurred frequently that the background region of high brightness is incorrect-extracted as a face field.

[0005] Moreover, binarization of the picture is divided and carried out to many blocks, while judging whether it is a backlight scene based on the rule of thumb "the distribution patterns of shading within a picture differ by the backlight picture and the follow light picture" from the brightness and configuration (distribution) of a dark space block according to which it was classified into dark space, to JP,8-62741,A, existence of a person is judged from a beige chromaticity and brightness, and the gradation compensator which was made to perform gradation amendment is indicated.

[0006] However, to most pictures photoed by the camera or the digital still camera having the unfixed and unknown direction of top and bottom, the above-mentioned technology is premised on the direction of top and bottom of a picture being fixed on the occasion of the judgment of a distribution of a dark space block, and is not taken into consideration at all about the case where a picture with the unfixed and unknown direction of top and bottom is processed. Therefore, since application of the above-mentioned technology is difficult about almost all the pictures photoed by the camera or the digital still camera, there is a fault that the scope of technical is narrow. Moreover, since the saturation of a face field became low, to the picture showing a backlight scene, there were judgment precision of a face field and a problem of falling sharply on the picture showing a backlight scene.

[0007] When the concentration of the field which accomplished this invention in consideration of the above-mentioned fact, and is equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, it is the purpose to obtain the image-processing method, image processing system, and record medium which can judge the field equivalent to a person's face with high precision.

[0008]

[Means for Solving the Problem] The image-processing method which starts invention according to claim 1 in order to attain the above-mentioned purpose Based on image data, considerable, then the face candidate field presumed are extracted to the face of the person in the picture which this image data expresses. The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. Based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation, the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated.

[0009] In invention according to claim 1, considerable, then the face candidate field presumed are first extracted to the face of the person in the picture which this image data expresses based on image data. On the occasion of extraction of this candidate field, well-known arbitrary algorithms are applicable from before. Next, the concentration in the extracted face candidate field (you may use any, such as average concentration, concentration which corresponds in the center of all the concentration regions in a face candidate field, and concentration equivalent to the peak of the gray level histogram in a face candidate field, that what is necessary is just a value representing the concentration in a face candidate field (or brightness)) is judged.

[0010] When the absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the face candidate field to the concentration of the whole picture is more than the 1st threshold here [ whether since the concentration in the extracted face candidate field is deflecting to the high concentration side, it is the field in which the extracted face candidate field is equivalent to a person's face in a backlight scene, and ] Or fields other than the field equivalent to a person's face may have been incorrect-extracted as a face candidate field (in this specification). The field equivalent to a person's face cannot be overemphasized by deflecting to a low concentration side on the negative picture which "concentration" means the concentration on a positive picture, for example, expresses a backlight scene. The absolute value of the concentration in a face candidate field or the relative value of the concentration in the face candidate field to the concentration of the whole picture beyond a predetermined value rather than the 1st threshold moreover, in below the threshold of a low 2nd Since the concentration in the extracted face candidate field was deflecting to the low concentration side, fields other than the field which is a field in which the extracted face candidate field is equivalent to a person's face in the scene which made the stroboscope emit light, or is equivalent to a person's face may have been incorrect-extracted as a face candidate field.

[0011] On the other hand, the result which examined the picture showing the scene on which the invention-in-this-application person made the picture showing a backlight scene, and the stroboscope emit light, lighting conditions and abbreviation of as opposed to a face in lighting conditions [ as opposed to a person's fuselage at these scenes ] — on the picture showing these scenes from a bird clapper similarly It found out that there was the common feature that the value as the concentration of the field equivalent to a person's face, concentration contrast, saturation contrast, and abbreviation with same concentration of the field equivalent to the fuselage of the aforementioned person who exists near the field equivalent to a person's face, concentration contrast, and saturation contrast is shown. By the picture showing a backlight scene, namely, the field equivalent to the aforementioned person's fuselage By the picture which expresses the scene which made the stroboscope emit light by concentration contrast and saturation contrast becoming small like the concentration of the field equivalent to a person's face while concentration deflects to a high concentration side While concentration as well as the concentration of the field equivalent to a person's face deflected the field equivalent to a person's fuselage to the low concentration side, concentration contrast and saturation contrast found out the bird clapper greatly.

[0012] Based on the above, by invention of a claim 1, when the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold or below the 2nd threshold The range presumed that the field equivalent to the fuselage of the person in a picture exists is set up on the basis of a face candidate field. A concentration difference with the face candidate field within the set-up limits is based on the existence of the field below a predetermined value. Equivalent to a person's fuselage within limits which evaluated the accuracy as a field equivalent to the face of the person of a face candidate field, or were set up on the basis of the face candidate field, then the fuselage candidate field presumed are extracted. Based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation, the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated.

[0013] For example, the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold. When the field below a predetermined value has a concentration difference with a face candidate field within limits presumed that the field equivalent to the fuselage of the person in the picture set up on the basis of the face candidate field exists A face candidate field has high possibility of being a field equivalent to a person's face in a backlight scene. The concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold. When the field below a predetermined value has a concentration difference with a face candidate field within limits presumed that the field equivalent to the fuselage of the person in the picture set up on the basis of the face candidate field exists It can be judged that a face candidate field has high possibility of being a field

equivalent to a person's face in the scene which made the stroboscope emitting light. Moreover, when the field below a predetermined value does not have a concentration difference with a face candidate field, it can be judged that a face candidate field has high possibility that it is not a field equivalent to a person's face.

[0014] In addition, if for example, the direction of top and bottom is known, the range presumed that the field equivalent to the fuselage of the person in a picture exists can be set up so that it may be distributed only in the direction in which the field equivalent to a person's fuselage should exist from a face candidate field, and if the direction of top and bottom is strange, it can be determined that it is continued and distributed over a perimeter centering on a face candidate field. Moreover, it can be determined that the size of the aforementioned range becomes large as the size of a face candidate field becomes large.

[0015] Moreover, the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold, for example. Equivalent to the fuselage of the person who extracted within limits in a face candidate field set up on the basis of the face candidate field, then when the contrast of the concentration in the fuselage candidate field presumed or saturation is below the 1st predetermined value, respectively A face candidate field has high possibility of being a field equivalent to a person's face in a backlight scene. The concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold. When the contrast of the concentration in a face candidate field and the aforementioned fuselage candidate field or saturation is beyond the 2nd predetermined value, respectively, it can be judged that a face candidate field has high possibility of being a field equivalent to a person's face in the scene which made the stroboscope emitting light. Moreover, when either [ at least ] a face candidate field or a fuselage candidate field does not satisfy the above-mentioned conditions, it can be judged that a face candidate field has high possibility that it is not a field equivalent to a person's face.

[0016] In addition, the algorithms equivalent to the fuselage of the person in a picture then with common knowledge more arbitrary than before also about the field presumed, for example, an algorithm given in JP,8-184925,A etc., are applicable.

[0017] And evaluation of the accuracy as a field equivalent to the face of the person of a face candidate field can be performed so that the aforementioned evaluation may become high as possibility of being a field equivalent to a person's face becomes high based on the judgment mentioned above. Thus, since invention of a claim 1 estimates the accuracy as a field equivalent to the face of the person of a face candidate field based on the characteristic quantity (concentration, concentration contrast, or saturation contrast) of a face candidate field and a fuselage candidate field When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, the accuracy as a field equivalent to a person's face can be evaluated with a sufficient precision, and the field which is equivalent to a person's face based on an evaluation result can be judged with high precision (or extraction).

[0018] In invention of a claim 1, when the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is more than a threshold of the above 1st, invention according to claim 2 The surface ratio of the field of each concentration region when dividing all the concentration regions of the aforementioned picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, and dividing the aforementioned picture into the field of each concentration region, And it is characterized by taking into consideration and evaluating at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field on the aforementioned picture.

[0019] While the concentration of the field equivalent to the person in a picture deflects to a high concentration side as mentioned above by the picture showing a backlight scene Since the concentration of the field equivalent to the background in a picture is deflected to a low concentration side, supposing it divides all the concentration regions of a picture into the



concentration region more than a three-stage, for example and divides a picture into the field of each concentration region. The field of a high concentration region and the field of a low concentration region occupy the larger area in a picture respectively, and the area of the field of a middle concentration region becomes small. Moreover, if the field equivalent to the face of the person in the picture showing a backlight scene removes the high-concentration field equivalent to a person's fuselage, since the great portion of circumference is surrounded by the low-concentration field equivalent to a background, the concentration distribution in the field which exists in the circumference of the field equivalent to a person's face is deflected to a low concentration side.

[0020] The above-mentioned property of a picture of expressing a backlight scene with invention according to claim 2 is used. When the concentration in a face candidate field (an absolute value or relative value) is more than the 1st threshold, Namely, when a face candidate field may be a field equivalent to a person's face in a backlight scene. Either [ at least ] the surface ratio of the field of each concentration region when dividing a picture into the field of the concentration region more than a three-stage or the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is taken into consideration. Since the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated, the field equivalent to the face of the person who exists in the picture showing a backlight scene can be judged more to high degree of accuracy (or extraction).

[0021] In addition, while the concentration of the field equivalent to the person in a picture deflects the picture showing a backlight scene to a high concentration side, since the concentration of the field equivalent to the background in a picture is deflected to a low concentration side, the concentration distribution (gray level histogram) of the whole picture serves as a configuration to which a peak (mountain) appears respectively in a high concentration region and a low concentration region, and a valley appears in a middle concentration region. For this reason, it replaces with the judgment based on the above-mentioned surface ratio, and you may make it evaluate based on the configuration of a gray level histogram.

[0022] In invention of a claim 1, when the absolute value of the concentration in the aforementioned face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture is below a threshold of the above 2nd, invention according to claim 3. It is characterized by the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of the aforementioned face candidate field taking into consideration and evaluating the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field on the aforementioned picture.

[0023] On the scene which made the stroboscope emit light, the concentration of the field which the concentration of the field equivalent to the person in a picture deflects to a low concentration side, and is equivalent to the background in a picture is deflected in many cases to a high concentration side. For this reason, if the field equivalent to the face of the person in the picture showing the scene which made the stroboscope emit light removes the low-concentration field equivalent to a person's fuselage, it will be surrounded in many cases by the high-concentration field in which the great portion of circumference is equivalent to a background, and the concentration distribution in the field which exists in the circumference of the field equivalent to a person's face will be deflected in many cases to a high concentration side.

[0024] The above-mentioned property of a picture of expressing with invention according to claim 3 the scene which made the stroboscope emitting light is used. When the concentration in a face candidate field (an absolute value or relative value) is below the 2nd threshold, Namely, when a face candidate field may be a field equivalent to a person's face in the scene which made the stroboscope emit light, the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration. Since the accuracy as a field equivalent to the face

of the person of a face candidate field is evaluated, the field equivalent to the face of the person who exists in the picture showing the scene which made the stroboscope emit light can be judged more to high degree of accuracy (or extraction).

[0025] That the image processing system concerning invention according to claim 4 is equivalent to the face of the person in the picture which this image data expresses based on image data, then an extraction means to extract the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. Since it is constituted including an evaluation means to evaluate the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field, based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side like invention of a claim 1, the field equivalent to a person's face can be judged with high precision (or extraction).

[0026] That the record medium concerning invention according to claim 5 is equivalent to the face of the person in the picture which this image data expresses based on image data, then the 1st step which extracts the face candidate field presumed, The absolute value of the concentration in the extracted face candidate field or the relative value of the concentration in the aforementioned face candidate field to the concentration of the aforementioned whole picture Rather than more than the 1st threshold or the 1st threshold of the above, beyond a predetermined value in below the threshold of a low 2nd The range presumed that the field equivalent to the fuselage of the person in the aforementioned picture exists is set up on the basis of the aforementioned face candidate field. A concentration difference with the aforementioned face candidate field within the set-up limits is based on the existence of the field below a predetermined value. [ whether the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field is evaluated, and ] Or equivalent to a person's fuselage within limits set up on the basis of the aforementioned face candidate field, then the fuselage candidate field presumed are extracted. The program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of the aforementioned face candidate field based on the contrast of the concentration in the aforementioned face candidate field and the fuselage candidate field which carried out [ aforementioned ] extraction, or saturation is recorded.

[0027] The processing which contains the 1st above-mentioned step and the 2nd step in the record medium concerning invention according to claim 5, Namely, since the program for making invention of a claim 1 perform processing concerning the image-processing method of a publication to a computer is recorded By reading and executing the program to which the computer is recorded on the aforementioned record medium When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side like invention of a claim 1, the field equivalent to a person's face can be judged with high precision (or extraction).

[0028]

[Embodiments of the Invention] Hereafter, with reference to a drawing, an example of the operation gestalt of this invention is explained in detail.

[0029] The [1st operation gestalt] The image processing system 10 with which this invention was

applied is shown in drawing 1 . A scanner 12, an image processing system 14, and a printer 16 are connected in series, and the image processing system 10 is constituted.

[0030] A scanner 12 is a film picture (after photoing a photographic subject) currently recorded on photosensitive material (a photographic film is only called below), such as a photographic film (for example, a negative film and a reversal film). The negative picture or positive picture visualized by a development being carried out is read. The light with which the image data obtained by this reading is outputted, it was injected from the light source 20, and quantity of light unevenness was reduced by the optical diffusion box 22. The photographic films 26 set to the tape carrier package 24, such as a negative film and a reversal film, irradiate. It is constituted so that image formation of the light which penetrated the photographic film 26 may be carried out through a lens 28 on the light-receiving side of the CCD sensor 30 (you may be a line sensor even if it is an area sensor).

[0031] A tape carrier package 24 conveys a photographic film 26 so that the part where the film picture on a photographic film 26 is recorded may be located in order on the optical axis of the injection light from the light source 20. The film picture currently recorded on the photographic film 26 is read in order by the CCD sensor 30 by this, and the signal corresponding to a film picture is outputted from the CCD sensor 30. The signal outputted from the CCD sensor 30 is changed into digital image data by A/D converter 32, and is inputted into an image processing system 14.

[0032] The line scanner amendment section 36 of an image processing system 14. The dark amendment which reduces the dark output level of the cell which corresponds for every pixel from the inputted scanning data (data of R, G, and B inputted from a scanner 12). The concentration conversion which carries out logarithmic transformation of the data which performed dark amendment to the data showing a concentration value. The quantity of light unevenness of the light which illuminates a photographic film 26 is embraced. the data after concentration conversion. An amendment shading compensation, Each processing of the defective pixel amendment which interpolates the data of a cell (the so-called defective pixel) with which the signal corresponding to the amount of incident lights is not outputted among the data which performed this shading compensation from the data of a surrounding pixel, and newly generates them is performed in order. The outgoing end of the line scanner amendment section 36 is connected to the input edge of I/O controller 38, and the data with which each aforementioned processing was performed in the line scanner amendment section 36 are inputted into I/O controller 38 as scanning data.

[0033] The input edge of I/O controller 38 is connected also to the data output edge of an image processor 40, and the image data to which the image processing (it mentions later for details) was performed is inputted from an image processor 40. Moreover, the input edge of I/O controller 38 is connected also to the personal computer 42. The personal computer 42 is equipped with the expansion slot (illustration ellipsis), and the driver (illustration ellipsis) which performs read-out/writing of data to the digital camera card in which image data was written by the digital still camera etc. is connected to this expansion slot. When file image data (image data read from the digital camera card) is inputted from the exterior through an expansion slot, the inputted file image data is inputted into I/O controller 38.

[0034] It connects with the data input edge of an image processor 40, the auto setup engine 44, and the personal computer 42 respectively, and the outgoing end of I/O controller 38 is further connected to the printer 16 through the I/F circuit 54. I/O controller 38 outputs the inputted image data to each aforementioned device connected to the outgoing end alternatively.

[0035] This operation gestalt performs two reading in different resolution in a scanner 12 to each film picture currently recorded on the photographic film 26. Reading of the whole surface of a photographic film 26 is comparatively performed on the 1st reading conditions (quantity of light for every wavelength region of R, G, and B of the light which irradiates a photographic film 26, charge-storage time of the CCD sensor 30) which the concentration of a film picture determined very much that the saturation of a stored charge will not arise by the CCD sensor 30 in a low case (for example, negative picture of the exposure undershirt in a negative film) in reading (henceforth a press can) by the low resolution. The data (press can data) obtained by this press

can are inputted into the auto setup engine 44 from I/O controller 38.

[0036] The auto setup engine 44 is equipped with CPU46, RAM48 (for example, DRAM), ROM50 (for example, ROM which can rewrite the content of storage), and input/output port 52, and these are mutually connected through a bus and it is constituted. The auto setup engine 44 judges the coma position of a film picture based on the press can data inputted from I/O controller 38, and extracts the data (press can image data) corresponding to the film image recording field on a photographic film 26. Moreover, based on press can image data, while judging the size of a film picture, picture characteristic quantity, such as concentration, is calculated, and the reading conditions at the time of a scanner 12 performing reading (henceforth a fine scan) for the second time by high resolution comparatively are determined to the photographic film 26 which performed the press can. And a coma position and reading conditions are outputted to a scanner 12.

[0037] Moreover, the auto setup engine 44 is based on press can image data (or low-resolutionized file image data). Picture characteristic quantity including extraction of the principal part in a picture (for example, field equivalent to a person's face (face field)) is calculated. A scanner 12 determines automatically the processing conditions of various kinds of image processings over the fine scan image data (or file image data) obtained by performing a fine scan according to an operation (setup operation), and outputs the determined processing conditions to an image processor 40.

[0038] The display, the keyboard, and the mouse are connected to the personal computer 42 (all ar illustration ellipses). A personal computer 42 incorporates the processing conditions of the image processing for which it opted with the auto setup engine 44, performs an image processing equivalent to the image processing performed by the image processor 40 for a high-resolution image data to low resolution picture data based on the incorporated processing conditions, and generates simulation image data while it incorporates the image data of a low resolution from th auto setup engine 44.

[0039] And the generated simulation image data is changed into the signal for displaying a picture on a display, and a simulation picture is displayed on a display based on this signal. Moreover, if the information which official approval of quality of image etc. is performed by the operator, and directs correction of processing conditions as an official approval result to the displayed simulation picture is inputted through a keyboard, this information will be outputted to the auto setup engine 44. Thereby, with the auto setup engine 44, processing of the re-operation of the processing conditions of an image processing etc. is performed.

[0040] The fine scan image data (or file image data) inputted into I/O controller 38 by performing a fine scan to a film picture with a scanner 12 on the other hand is inputted into an image processor 40 from I/O controller 38. An image processor 40 is respectively equipped with the image-processing circuit which performs various kinds of image processings, such as hyper-sharpness processing in which sharpness is emphasized, suppressing the shape of a color and concentration amendment processing including a gray scale conversion or color conversion, pixel density transform processing, the hyper-tone processing that compresses the gradation of the extremely-low-frequency brightness component of a picture, and a grain, and performs various image processings to the inputted image data according to the processing conditions determined and notified for every picture with the auto setup engine 44.

[0041] As an image processing which can be performed by the image processor 40 In addition to the above, for example, the whole picture, the sharpness amendment which receives in part (for example, field equivalent to a person's face), or soft focus processing, the image processing (the image processing which makes a monotone to an output picture --) which changes a drawing tone intentionally The image processing which makes a portrait tone to an output picture, the image processing which makes a sepia tone to an output picture, the image processing (for example, the image processing for making a thin figure to the person who exists in a subject-copy image on the main picture --) which processes a picture As opposed to the image processing which corrects bloodshot eyes, and the picture photoed by LF (disposable camera) The geometric distortion of the picture resulting from the distortion aberration of the lens of LF, and the chromatic aberration of magnification, The lightness fall of the periphery section of the

picture which originates a color gap in limb darkening of amendment LF aberration amendment processing and the lens of LF Amendment limb-darkening amendment processing, LF aberration amendment processing of amendment various kinds etc. is mentioned in deterioration of the quality of image of the output picture which originates the fall of the sharpness of the picture resulting from the property of the lens of LF in the property of the lens of LF like amendment focus dotage amendment processing.

[0042] When using for record of the picture to printing paper the image data to which the image processing was performed by the image processor 40, the image data to which the image processing was performed is outputted to a printer 16 as image data for record through the I/F circuit 54 from I/O controller 38 by the image processor 40. Moreover, when outputting to the exterior by making the image data after an image processing into an image file, image data is outputted to a personal computer 42 from I/O controller 38. This outputs the image data inputted from I/O controller 38 as an object for the output to the exterior as an image file through an expansion slot in a personal computer 42 to the exteriors (for example, the write-in equipment which writes image data in information-storage media, such as CD-R, other information processors connected through the communication controller).

[0043] The printer 16 is equipped with the laser driver 62 which controls the operation of an image memory 58, the laser light source 60 of R, G, and B, and this laser light source 60. Once the image data for record inputted from the image processing system 14 is memorized by the image memory 58, it is read, and it is used for the modulation of the laser beam of R, G, and B which are injected from a laser light source 60. The laser beam injected from the laser light source 60 has a printing paper 68 top scanned through the polygon mirror 64 and the ftheta lens 66, and exposure record of the picture is carried out at printing paper 68. The printing paper 68 in which exposure record of the picture was carried out is sent to the processor section 18, and each processing of the color development, bleaching fixing, rinsing, and dryness is performed. Thereby, the picture by which exposure record was carried out is visualized by printing paper 68.

[0044] Next, the face field extraction and concentration data processing performed after inputting press can data into an image processing system 14 and processing logging of the image data from press can data etc. in the auto setup engine 44 as an operation of this operation gestalt from a scanner 12 are explained.

[0045] It is the processing to which the image-processing method concerning invention of a claim 1 was applied, and face field extraction and concentration data processing concerning this operation gestalt (the backlight scene judging processing and stroboscope luminescence scene judging processing which are mentioned later are included) are realized by performing face field extraction and a concentration amendment program by CPU46 of the auto setup engine 44. The information-storage medium 72 (refer to drawing 1) memorizes at the beginning with the program for face field extraction and a concentration amendment program performing other processings by CPU46. In addition, although the information-storage medium 72 is shown as a floppy disk, other information-storage media, such as CD-ROM and memory card, may constitute from drawing 1. If the information read-out equipment (illustration ellipsis) connected to the personal computer 42 is loaded with the information-storage medium 72 and import (installation) of the program from the information-storage medium 72 to an image processing system 14 is directed, with information read-out equipment, face field extraction, a concentration amendment program, etc. will be read from the information-storage medium 72, and ROM50 which can rewrite the content of storage will memorize.

[0046] And if the timing which should perform face field extraction and concentration amendment processing comes, face field extraction and a concentration amendment program will be read from ROM50, and face field extraction and a concentration amendment program will be performed by CPU46. Thereby, the auto setup engine 44 functions as an image processing system concerning invention of a claim 4. Thus, the information-storage medium 72 which has memorized face field extraction, the concentration amendment program, etc. is equivalent to the record medium according to claim 5.

[0047] Hereafter, face field extraction and concentration amendment processing are explained with reference to the flow chart of drawing 2. Considerable, then face candidate field extraction

processing in which the field (face candidate field) presumed is extracted are performed to the face of the person in a picture from the picture which image data expresses with Step 100 based on the image data of a processing object. As a sampling procedure for performing this face candidate field extraction processing Equivalent to the face of the person in a picture, then the face candidate field sampling procedure which judges the field presumed and extracts this field as a face candidate field, Considerable, then the background removal method which judges the field (background region) presumed and extracts fields other than a background region as a face candidate field are in the background in a picture. specifically Inside [ it is the following face candidate sampling procedures better known than before and a background removal method ] can adopt at least any they are, and face candidate field extraction processing can be performed.

[0048] [Example 1 of a face candidate field sampling procedure] While dividing a picture into much point of measurement, each point of measurement R, It is based on the data (image data) obtained by decomposing into three colors of G and B. it judges whether each point of measurement is contained within the limits of flesh color on the color coordinate, and the field where the cluster (group) of the point of measurement judged to be within the limits of flesh color exists is extracted as a face candidate field (a Provisional-Publication-No. 52 No. -156624 official report --) Provisional Publication No. 52 No. -156625 official report, JP,53-12330,A, Provisional Publication No. 53 No. -145620 official report, Provisional Publication No. 53 No. -145621 official report, Provisional Publication No. References, such as 53 No. -145622 official report.

[0049] [Example 2 of a face candidate field sampling procedure] It asks for the histogram about a hue value (and saturation value) based on the aforementioned image data. It divides into the group corresponding to the mountain which judged to any of the mountain which divided the histogram for which it asked for every mountain, and each point of measurement divided it would belong, and divided each point of measurement. A picture is divided into two or more fields for every group, the field which is equivalent to a person's face among two or more of these fields is presumed, and the presumed field is extracted as a face candidate field (refer to JP,4-346333,A).

[0050] [Example 3 of a face candidate field sampling procedure] It searches for any one of the configuration patterns (for example, configuration pattern showing the profile of a head, the profile of a face, etc.) peculiar to each part of the person who exists in a picture based on the aforementioned image data. According to the physical relationship of the predetermined portion the person's [ whom the size of the detected configuration pattern, the sense, and the detected configuration pattern express ], and a person's face, considerable, then the field presumed are set as a person's face. Moreover, it looks for other different configuration patterns from the detected configuration pattern, the adjustment as a person's face of the field set up previously is searched for, and a face candidate field is extracted (references, such as JP,8-122944,A, JP,8-184925,A, and JP,9-138471,A).

[0051] [Example 4 of a face candidate field sampling procedure] While calculating the variation of the concentration in each part in a picture, or brightness for every direction based on the aforementioned image data and setting up a reference point The search direction pattern showing the change direction of the concentration or the brightness in each part of this search range and search within the limits for which it should search is set up to this reference point according to the profile configuration of a face field. The variation of the concentration which met in the direction which exists in aforementioned search within the limits, and the aforementioned search direction pattern expresses, or brightness searches the part beyond a predetermined value. By repeating setting up this part as a next reference point, when the part with which are satisfied of search conditions is detected, and extracting the line which connects two or more places of the picture set up in order as the aforementioned reference point, and changes as a border line showing the profile of a face field A face candidate field is extracted (references, such as JP,9-138471,A).

[0052] [Example 1 of a background removal method] It is based on the aforementioned image data. each point of measurement It judges whether it is contained within the limits of the specific

colors (for example, blue of empty or the sea, grass, wooden green, etc.) which belong to a background clearly on a color coordinate. The field where the cluster (group) of the point of measurement judged to be specific aforementioned color within the limits exists is judged to be a background region, it removes, and the field which remained is extracted as a non-background region (field where possibility that the field equivalent to a person's face is included is high : also this face candidate field of this invention).

[0053] [Example 2 of a background removal method] after dividing a picture as well as Example 2 of a previous principal part sampling procedure into two or more fields based on the aforementioned image data the characteristic quantity (the ratio for the bay contained in a profile —) as a field which is equivalent to a background for every field The degree of axial symmetry, the number of irregularity, ratio contact with a picture rim, the concentration contrast in a field, Ask for the existence of the change pattern of the concentration in a field etc., and the field which each field judged whether it was a background region based on the calculated characteristic quantity, and was judged to be a background is removed. The field which remained is extracted as a non-background region (face candidate field) (references, such as JP,8-122944,A and JP,8-184925,A).

[0054] In addition, the above-mentioned sampling procedure is a mere example, and from a picture, if it is the sampling procedure which extracts the field presumed, it cannot be overemphasized equivalent to a person's face, then that it can apply no matter it may be what method. Moreover, at Step 100, respectively with the application of two or more sorts of sampling procedures, face candidate field extraction processing may be performed two or more times, processing conditions may be respectively changed by the sampling procedure of a single kind, and face candidate field extraction processing may be performed two or more times. In addition, Step 100 corresponds to the extraction means according to claim 4.

[0055] Backlight scene judging processing is performed at the following step 102. Hereafter, this backlight scene judging processing is explained with reference to the flow chart of drawing 3 . At Step 120, initial setting of the flag is carried out to 0. At Step 122, the data of a single face candidate field are incorporated out of the face candidate field extracted by face candidate field extraction processing of previous Step 100, and the average concentration Darea in a face candidate field is calculated. Henceforth [ the following step 124 ], it judges whether it is the field ("the face field of a backlight scene" is only called hereafter) in which the face candidate field which incorporated data is equivalent to the face of the person in the picture showing a backlight scene.

[0056] That is, at Step 124, it is the maximum concentration Dmax of the picture of a processing object. And the minimum concentration Dmin After asking, it judges whether the conditions (it is called Conditions a for convenience) as which the average concentration Darea in a face candidate field is specified by the following formula are fulfilled.

(Darea-Dmin) The left part of the conditional expression of the  $(D_{max}-D_{min}) > 75\%$  above expresses the relative value of the concentration in the face candidate field to the concentration of the whole picture of a processing object (average concentration), and the numeric value of the right-hand side corresponds to the 1st threshold concerning this invention. In addition, you may be made to perform the above-mentioned judgment by replacing with the relative value of the concentration in a face candidate field, and comparing the absolute value of this concentration with a predetermined value (the 1st threshold) using the absolute value of the concentration in a face candidate field.

[0057] It can be judged that the face candidate field which incorporated data at Step 122 is not a face field of a backlight scene since the concentration in a face candidate field is not deflecting to a high concentration side (low brightness side) when the judgment of Step 124 is denied. Therefore, when the judgment of Step 124 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136.

[0058] On the other hand, when the judgment of Step 124 is affirmed, it shifts to Step 126, and the search line (refer to the arrow shown in drawing 5 as an example) of the predetermined length prolonged in a radial in two or more predetermined directions centering on a face candidate field is set up respectively. In addition, since this search line is for searching the field



(fuselage field of a backlight scene) in which a face candidate field assumes in that it is the face field of a backlight scene, and is equivalent to a person's fuselage, the length of a search line can be made into the double-precision grade of the longitudinal direction length of for example, a face candidate field.

[0059] Moreover, if the direction of top and bottom of the picture of a processing object is known, since the direction where the fuselage field may exist to a face field will be limited, only by meeting in the direction in which the fuselage field may exist based on top-and-bottom information, you may make it set up a search line. Top-and-bottom information in addition, when the image data of a processing object is image data obtained by reading the picture currently recorded on the photographic film in which the magnetic layer was formed, [ for example, ] Magnetic recording is carried out to the magnetic layer of a photographic film in many cases to the timing at the time of photography record of a picture etc., and, in such a case, top-and-bottom information can be acquired by reading magnetically the information by which magnetic recording is carried out to the magnetic layer.

[0060] At the following step 128, a difference with the average concentration Darea in a face candidate field judges respectively whether it is less than the predetermined value alpha about all the pixels on the search line set up at Step 126. In addition, the predetermined value alpha can use the value about "20", supposing for example, a concentration value is expressed with the value of 0-255 by the data (28 = 256) which are 8 bits. And it judges whether there is any search line which is satisfied [ with Step 130 ] of the conditions "the concentration of all the pixels on a search line is the inside of Darea\*\*alpha."

[0061] In addition, below, the judgment of Step 130 is called conditions b for convenience. The judgment of Step 130 corresponds to the thing according to claim 1 "for which the accuracy as a field in which a concentration difference with the face candidate field within the range (rang which set up the search line) presumed that the field equivalent to the fuselage of the person in a picture exists is equivalent to the face of the person of a face candidate field based on the existence of the field below a predetermined value is evaluated."

[0062] By the picture showing a backlight scene, the concentration of a fuselage field as well as a face field is deflected to a high concentration side. Therefore, since it can judge that neither of the search lines starts the field which concentration is deflecting in the high concentration region, and the field which may be a fuselage field of a backlight scene does not exist in the circumference of a face candidate field when the judgment of Step 130 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136. Moreover, when the judgment of Step 130 is affirmed, it shifts to Step 132, and the concentration of all the pixels on the search line concerning the field which concentration is deflecting in the high concentration region, i.e., a search line, memorizes the direction where a search line is prolonged about the search line in Darea\*\*alpha (for example, search line caudad prolonged in drawing 5 ). And 1 is substituted for the following step 136 at a flag, and it shifts to Step 136.

[0063] At Step 136, it judges whether the processing and the judgment after Step 122 were performed to all the face candidate fields extracted by face candidate field extraction processing (Step 100). Steps 122-136 are repeated until it returns to Step 122 and the aforementioned judgment is affirmed, when a judgment is denied. By this, it will be respectively judged to all face candidate fields whether it is the face field of a backlight scene. And if the judgment of Step 136 is affirmed, it will shift to Step 138.

[0064] At Step 138, a flag judges whether it is 1. Since the face candidate field which fulfills Conditions a (judgment of Step 124) and Conditions b (judgment of Step 130) does not exist when the judgment of Step 138 is denied, it can be judged that the picture of a processing object is not a picture showing a backlight scene. For this reason, the picture of a processing object is judged at Step 154 to be a picture showing a non-backlight scene, and backlight scene judging processing is ended. Moreover, since the picture of a processing object may be a picture showing a backlight scene when the judgment of Step 138 is affirmed, all the concentration regions of a processing-object picture are classified into the concentration region of a three-stage at Step 140, and the picture of a processing object is classified into the field corresponding to each concentration region at the following step 140.



[0065] The concentration distribution (gray level histogram) of the usual picture (picture showing a non-backlight scene) serves as a configuration to which a peak appears in a middle concentration region by the concentration and the bird clappers with proper concentration of the principal part, such as a face field, as shown in drawing 6 (A) as an example. On the other hand, the picture showing a backlight scene serves as a configuration to which a peak appears respectively in a high concentration region and a low concentration region as shown in drawing 6 (B) as an example, when the concentration of the principal parts, such as a face field, deflects to a high concentration side and the concentration of a background region deflects to a low concentration side (high brightness side). Since the area of each field corresponding to each concentration region on a picture is proportional to the cumulative frequency for every concentration region in a gray level histogram, even if it compares drawing 6 (A) with drawing 6 (B), it has the feature that the picture showing a backlight scene has a very small area of the middle concentration field corresponding to a middle concentration region so that clearly.

[0066] For this reason, at the following step 144, the area of the low concentration field corresponding to a low concentration region is larger than the area of a middle concentration field, and the area of the high concentration field corresponding to a high concentration region judges whether they are latus (that is, (low concentration field area > middle concentration field area and middle concentration field area < high concentration field area), does it fill or not?) rather than the area of a middle concentration field. The number of concentration regions classified at previous Step 140 may classify all the concentration regions of a processing-object picture into the concentration region of four or more a large number that what is necessary is just the number which can judge Step 144. The judgment of Step 144 corresponds to the thing according to claim 2 "for which the surface ratio of the field of each concentration region when dividing all the concentration regions of a picture into the concentration region more than a three-stage for the accuracy as a field equivalent to the face of the person of a face candidate field, and dividing a picture into the field of each concentration region is also taken into consideration and evaluated."

[0067] It is different from the concentration distribution with the concentration distribution of the whole picture of a processing object peculiar to the picture showing a backlight scene when the judgment of Step 144 is denied, and since possibility that the picture of a processing object is not a picture showing a backlight scene is high, the picture of a processing object is judged at Step 154 to be a picture showing a non-backlight scene, and backlight scene judging processing is ended.

[0068] On the other hand, since the concentration distribution peculiar to the picture as which the face candidate field which fulfills Conditions a and Conditions b exists, and the concentration distribution of the whole picture of a processing object also expresses a backlight scene is shown when the judgment of Step 144 is affirmed, the picture of a processing object is judged at Step 146 to be a picture showing a backlight scene. At the following step 148, if the face candidate field which does not fulfill Conditions a and Conditions b is in the face candidate field extracted by face candidate field extraction processing, this field will be excepted from a face candidate field. The direction where the search line (search line whose concentration of all the pixels on a search line was in  $Darea \times \alpha$ ) which was satisfied [ with Step 150 ] of the conditions b in the face candidate field (face candidate field which was not excepted at Step 148) which fulfills Conditions a and Conditions b is prolonged is compared, and the direction of top and bottom of a picture is judged.

[0069] This judgment can calculate the number of the face candidate fields whose directions where the search line with which were satisfied of for example, the conditions b is prolonged correspond for every direction, and can be performed because the number of face candidate fields judges the most directions to be the direction of top and bottom. Moreover, at Step 150, if there is a face candidate field where the direction where the search line which satisfied Conditions b into each face candidate field is prolonged differs from the direction of top and bottom which carried out [ aforementioned ] the judgment greatly, this field will be excepted from a face candidate field.

[0070] And according to the adjustment degree (coincidence degree) of the direction where the

search line which was satisfied [ with the following step 152 ] of the conditions b over the direction of top and bottom judged at Step 150 to each face candidate field is prolonged, weight mark are set up respectively. In addition, these weight mark correspond to the evaluation value which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field, and Step 152 corresponds to the evaluation means according to claim 4 with the judgment of Steps 124, 130, and 144.

[0071] By the above-mentioned backlight scene judging processing, the picture of a processing object is a picture of a backlight scene, and weight mark high only about the face candidate field which is equivalent to the face field of a backlight scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up. If Step 152 is processed, backlight scene judging processing will be ended and it will shift to Step 104 of the flow chart of drawing 2.

[0072] It judges whether it was judged with the picture as which the picture of a processing object expresses a backlight scene in Step 104 in the backlight scene judging processing mentioned above. Although it shifts to Step 112 when a judgment is affirmed, when a judgment is denied, it shifts to Step 106, and stroboscope luminescence scene judging processing is performed. Hereafter, this stroboscope luminescence scene judging processing is explained with reference to the flow chart of drawing 4.

[0073] At Step 170, initial setting of the flag is carried out to 0. At Step 172, the data of a single face candidate field are incorporated out of the face candidate field extracted by face candidate field extraction processing, and the average concentration  $D_{area}$  in a face candidate field is calculated. Henceforth [ the following step 174 ], it judges whether it is the field ("the face field of a stroboscope luminescence scene" is only called hereafter) in which the face candidate field which incorporated data is equivalent to the face of the person in the picture showing the scene which made the stroboscope emit light.

[0074] That is, at Step 174, it is the maximum concentration  $D_{max}$  of the picture of a processing object. And the minimum concentration  $D_{min}$ . After asking, it judges whether the conditions (it is called Conditions c for convenience) as which the average concentration  $D_{area}$  in a face candidate field is specified by the following formula are fulfilled.

$(D_{area} - D_{min}) / (D_{max} - D_{min}) < 25\%$  above expresses the relative value of the concentration in the face candidate field to the concentration of the whole picture of a processing object (average concentration), and the numeric value of the right-hand side corresponds to the 2nd threshold concerning this invention. In addition, you may be made to perform the above-mentioned judgment by replacing with the relative value of the concentration in a face candidate field, and comparing the absolute value of this concentration with a predetermined value (the 2nd threshold) using the absolute value of the concentration in a face candidate field.

[0075] It can be judged that the face candidate field which incorporated data at Step 172 is not a face field of a stroboscope luminescence scene since the concentration in a face candidate field is not deflecting to a low concentration side when the judgment of Step 174 is denied. Therefore, when the judgment of Step 174 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188.

[0076] On the other hand, when the judgment of Step 174 is affirmed, it shifts to Step 176, and the search range for searching the fuselage candidate field equivalent to a person's fuselage to the picture of a processing object is set up. In addition, as a search range of a fuselage candidate field, a face candidate field and the field whose center position corresponds (the shape of a circle configuration or a rectangle has) can be set up, for example (the field of a circle configuration is shown in drawing 7 (A)), and it can be determined that the size of the search range becomes large as the size of a face candidate field becomes large. Moreover, if the direction of top and bottom of the picture of a processing object is known, since the direction where the fuselage field may exist to a face field will be limited, the search range can be set up so that the search range may be distributed only in the direction in which it may see from a face candidate field based on top-and-bottom information, and the fuselage candidate field may exist (refer to drawing 7 (B) as an example).

[0077] If the search range is set up as mentioned above, it will be set-up search within the limits, and Step 174 will be searched for a fuselage candidate field. Search of a fuselage candidate field can look for the configuration pattern which is search within the limits and expresses the profile of a person's fuselage, and can be performed by judging the adjustment as a field equivalent to a person's fuselage based on physical relationship with the detected size of a configuration pattern, the sense, and the detected configuration pattern and face candidate field as indicated by JP,8-184925,A. Moreover, on the occasion of search of the configuration pattern showing the profile of a fuselage, you may apply well-known technology, such as the extraction method of the specific configuration field a publication, to JP,9-138471,A.

[0078] At the following step 178, it judges whether there was any field which can be judged to be a fuselage candidate field by search of the above-mentioned fuselage candidate field. When a judgment is denied, since it can judge that the face candidate field which incorporated data at Step 172 is not a face field of a stroboscope luminescence scene, a face candidate field stops the judgment of being the face field of a stroboscope luminescence scene, and shifts to Step 188. Moreover, when the judgment of Step 178 is affirmed, it shifts to Step 180, and the average concentration in the fuselage candidate field extracted by search of a fuselage candidate field is calculated, and a difference with the average concentration Darea in a face candidate field judges whether it is less than the predetermined value alpha.

[0079] In addition, below, the judgment of Step 180 is called conditions d for convenience. The judgment of Step 180 also corresponds to the thing according to claim 1 "for which the accuracy as a field in which a concentration difference with the face candidate field within the range (the search range of a fuselage candidate field) presumed that the field equivalent to the fuselage of the person in a picture exists is equivalent to the face of the person of a face candidate field based on the existence of the field below a predetermined value (fuselage candidate field which fulfills Conditions d) is evaluated."

[0080] By the picture showing a stroboscope luminescence scene, the concentration of a fuselage field as well as a face field is deflected to a low concentration side. For this reason, since it can judge that the extracted fuselage candidate field has high possibility that it is not a field equivalent to a person's fuselage if the picture of a processing object is assumed to be the picture of a stroboscope luminescence scene when the judgment of Step 180 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 180 is affirmed, it shifts to Step 182, and considerable, then the concentration distribution in the circumference field which set up the field (circumference field) presumed (refer to drawing 7 (C) as an example), and was set up are calculated for the background in the picture which exists in the circumference of a face candidate field on the basis of a face candidate field.

[0081] As for the concentration distribution (gray level histogram) of the field which is equivalent to the background in a picture here by the usual picture (picture which expresses with a non-backlight the scene which does not make a stroboscope emit light), as shown in drawing 8 (A) as an example, the position deflected to the high concentration side a little has more the configurations and bird clappers in which a peak appears than the center of the concentration region of the whole picture. On the other hand, as the concentration distribution (gray level histogram) of the background region in the picture showing a stroboscope luminescence scene is shown in drawing 8 (B) as an example, the configuration and bird clapper which the position of a peak deflected to the high concentration side extremely are almost the case. Although a part of low concentration field equivalent to a person's fuselage will be included as the above-mentioned circumference field is shown in drawing 7 (C) when a face candidate field is a face field of a stroboscope luminescence scene, since the area which this field occupies to a circumference field is small, a concentration distribution serves as a configuration as similarly shown in drawing 8 (B).

[0082] For this reason, at the following step 184, the biased degree by the side of the high concentration of the concentration distribution in the circumference field calculated at previous Step 182 judges whether it is more than a threshold. In addition, the biased degree of a concentration distribution can be expressed using a concentration value when the biased degree

of the peak position of the configuration of a concentration distribution and the cumulative frequency from a high concentration side become a predetermined value etc., and the judgment of Step 184 can be performed by comparing with a predetermined value any of such characteristic quantity they are. Moreover, below, the judgment of Step 184 is called conditions e for convenience. The judgment of Step 184 corresponds to the thing according to claim 3 "for which the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field also takes into consideration and evaluates the accuracy as a field equivalent to the face of the person of a face candidate field on a picture."

[0083] Since it can judge that the face candidate field which incorporated data at Step 172 has high possibility that it is not the face field of a stroboscope luminescence scene when the judgment of Step 184 is denied, the judgment of being the face field of a stroboscope luminescence scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 184 is affirmed, it shifts to Step 186, and 1 is substituted for a flag and it shifts to Step 188.

[0084] At Step 188, it judges whether the processing and the judgment after Step 172 were performed to all the face candidate fields extracted by face candidate field extraction processing (Step 100). Steps 172-188 are repeated until it returns to Step 172 and the aforementioned judgment is affirmed, when a judgment is denied. By this, it will be respectively judged to all face candidate fields whether it is the face field of a stroboscope luminescence scene. And if the judgment of Step 188 is affirmed, it will shift to Step 190.

[0085] At Step 190, a flag judges whether it is 1. Since the face candidate field which fulfills Conditions c (judgment of Step 174), Conditions d (judgment of Step 180), and Conditions e (judgment of Step 184) does not exist when the judgment of Step 190 is denied, it can be judged that the picture of a processing object is not a picture showing a stroboscope luminescence scene. For this reason, the picture of a processing object is judged at Step 200 to be a picture showing a non-stroboscope luminescence scene, and stroboscope luminescence scene judging processing is ended.

[0086] On the other hand, since the face candidate field with which are respectively satisfied of Conditions c, Conditions d, and Conditions e exists when the judgment of Step 190 is affirmed, it shifts to Step 192, and the picture of a processing object is judged to be a picture showing a stroboscope luminescence scene. At the following step 194, if the face candidate field which does not fulfill each conditions of Conditions c, Conditions d, and Conditions e is in the face candidate field extracted by face candidate field extraction processing, this field will be excepted from a face candidate field.

[0087] At Step 196, the direction where the fuselage candidate field respectively extracted corresponding to each face candidate field exists is compared to the face candidate field (face candidate field which was not excepted at Step 194) which fulfills each aforementioned conditions, and the direction of top and bottom of a picture is judged. The direction where for example, the fuselage candidate field exists can calculate the number of the same face candidate fields for every direction, and can perform this judgment because the number of face candidate fields judges the most directions to be the direction of top and bottom.

[0088] And at the following step 198, weight mark are respectively set up to each face candidate field according to the adjustment degree (coincidence degree) of the direction where the fuselage candidate field to the direction of top and bottom judged at Step 196 exists, and the biased degree by the side of the high concentration of the concentration distribution in the boundary region of each face candidate field. In addition, these weight mark correspond to the evaluation value which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field, and Step 152 corresponds to the evaluation means according to claim 4 with the judgment of Steps 174, 180, and 184.

[0089] By the above-mentioned stroboscope luminescence scene judging processing, the picture of a processing object is a picture of a stroboscope luminescence scene, and weight mark high only about the face candidate field which is equivalent to the face field of a stroboscope luminescence scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up. If Step 198 is processed, stroboscope luminescence scene judging

processing will be ended and it will shift to Step 108 of the flow chart of drawing 2.

[0090] It judges whether it was judged with the picture as which the picture of a processing object expresses a stroboscope luminescence scene in Step 108 in the stroboscope luminescence scene judging processing mentioned above. When a judgment is affirmed, it shifts to Step 112. Moreover, when a judgment is denied, in Step 110, the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated in accordance with the usual error criterion to each face candidate field (when it judges that the picture of a processing object is not the picture showing a backlight scene but a picture showing a stroboscope luminescence scene, either), and weight mark are respectively set as each face candidate field according to an evaluation result.

[0091] Step 112 compares respectively the weight mark P of each face candidate field with the threshold THF for a face field judging, and the weight mark P are Threshold THF. It is extract d, using the above face candidate field as a face field (selection). Moreover, at the following step 114, according to the following (1) formula or (2) formulas, the face field concentration Mface of the picture of a processing object is calculated, and face field extraction and concentration data processing are ended.

[0092]

[Equation 1]

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i) / \sum_{i=1}^N P_i \quad \dots (1)$$

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i \cdot S_i) / \sum_{i=1}^N (P_i \cdot S_i) \quad \dots (2)$$

[0093] However, the sign for i discriminating each face candidate field and N are the total of a face candidate field, and Mi. The concentration of the face candidate field i, and Pi The weight mark of the face candidate field i, and Si It is the area of the face candidate field i.

[0094] (1) The face field concentration Mface is the weighted average efficiency of the concentration M of each face candidate field, by (1) formula, is carrying out weighting of each face candidate field based on the weight mark P of each face candidate field, and is carrying out weighting of each face candidate field based on the weight mark P and area S in (2) formulas so that more clearly than a formula and (2) formulas.

[0095] If the above-mentioned face field extraction and concentration data processing are performed, although the auto setup engine 44 calculates further the processing conditions of various kinds of image processings performed by the image processor 40, the processing result of face field extraction and concentration data processing will be used for the operation of the processing conditions of a part of image processings. For example, the face field extracted at previous Step 112 is used for the operation of the image processings (for example, sharpness amendment, bloodshot-eyes amendment, etc. to a face field) only for the face field performed by the image processor 40, or its part, and processing conditions are set up so that the aforementioned image processing may be performed only for a face field. Moreover, processing conditions, such as concentration amendment conditions, calculate the face field concentration Mface calculated at previous Step 114 so that it may be used for the image processings (for example, a color, concentration amendment, etc.) for the whole picture performed by the image processor 40, for example, the face field concentration Mface may turn into predetermined concentration.

[0096] As explained also in advance, with a \*\*\*\* 1 operation gestalt Since the picture of a processing object judged based on Conditions a and b etc. for whether it is the picture of a backlight scene, and it has judged based on Conditions c, d, and e for whether it is the picture of a stroboscope luminescence scene when it is not the picture of a backlight scene The picture of a processing object is the picture of a backlight scene, or a picture of a stroboscope luminescence scene, and by incorrect extraction of the face candidate field in face candidate field extraction processing Though the field which is not a face field in fact is intermingled in the extracted face candidate field While the probability that high weight mark will not be set as the field incorrect-extracted according to the conditions mentioned above, and the face candidate

field which is not a face field in fact will be extracted as a face field is reduced sharply. It can also be prevented that face field concentration changes with the concentration of the face candidate field which is not a face field in fact sharply.

[0097] Therefore, proper processing conditions are acquired also to each image processing which processing conditions calculate using the extraction result of a face field, or the face field concentration  $M_{face}$ , and a processing result proper also about each image processing performed by the image processor 40 for fine scan image data is obtained.

[0098] The [2nd operation gestalt] The 2nd operation gestalt of this invention is explained below. In addition, since a \*\*\*\* 2 operation gestalt is the same composition as the 1st operation gestalt, the same sign is given to each portion, explanation of composition is omitted, and only a portion which is different from the 1st operation gestalt about an operation of the 2nd operation gestalt is explained hereafter.

[0099] With a \*\*\*\* 2 operation gestalt, it replaces with backlight scene judging processing ( drawing 3 ) in which it explained with the 1st operation gestalt, and backlight scene judging processing shown in drawing 9 is performed. When the judgment of Step 124 is affirmed, it shifts to Step 156 (when the face candidate field fulfills Conditions a), and like Step 176 of the stroboscope luminescence scene judging processing ( drawing 4 ) concerning the 1st operation gestalt, the fuselage candidate area search range is set up and this backlight scene judging processing is searched for a fuselage candidate field. At the following step 158, it judges whether there was any field which can be judged to be a fuselage candidate field by search of a fuselage candidate field. When a judgment is denied, a face candidate field stops the judgment of being the face field of a backlight scene, and shifts to Step 136.

[0100] Moreover, when the judgment of Step 158 is affirmed, it shifts to Step 160, and the average concentration in the fuselage candidate field extracted by search of a fuselage candidate field is calculated, and a difference with the average concentration  $D_{area}$  in a face candidate field judges whether it is less than the predetermined value  $\alpha$ . In addition, below, the judgment of Step 160 is called conditions f for convenience. Since it can judge that the extracted fuselage candidate field has high possibility that it is not a field equivalent to a person's fuselage if the picture of a processing object is assumed to be the picture of a backlight scene when the judgment of Step 160 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 136.

[0101] Moreover, when the judgment of Step 160 is affirmed, it shifts to Step 162, and the concentration contrast in a face candidate field and the extracted fuselage candidate field (or saturation contrast) is calculated respectively. And threshold  $Th_1$  as which the contrast in a face candidate field and a fuselage candidate field was beforehand determined at the following step 164. It judges whether it is the following. In addition, below, the judgment of Step 164 is called conditions g for convenience. The judgment of Step 164 corresponds to the thing according to claim 1 "for which the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation."

[0102] On the picture showing a backlight scene, while the contrast about the concentration in a face field (and saturation) becomes small, the contrast about the concentration in a fuselage field (and saturation) becomes small similarly. For this reason, since it can judge that the face candidate field which incorporated data at Step 122 has high possibility that it is not the face field of a backlight scene when the judgment of Step 164 is denied, a face candidate field stops the judgment of being the face field of a backlight scene, and shifts to Step 136.

[0103] Moreover, when the judgment of Step 164 is denied, it shifts to Step 166, and equivalent to the background in the picture which exists in the circumference of a face candidate field on the basis of a face candidate field like Step 182 of the stroboscope luminescence scene judging processing concerning the 1st operation gestalt, then the concentration distribution in the circumference field which set up the field (circumference field) presumed and was set up are calculated. As the concentration distribution (gray level histogram) of the background region in the picture showing a backlight scene is shown in drawing 8 (C) as an example, the configuration and bird clapper which the position of a peak deflected greatly to the low concentration side are

most, and the concentration distribution (refer to drawing 8 (A)) of the background region in the usual picture is greatly different. Although a part of low concentration field equivalent to a person's fuselage will be included as the above-mentioned circumference field is shown in drawing 7 (C) when a face candidate field is a face field of a backlight scene, since the area which this field occupies to a circumference field is small, a concentration distribution serves as a configuration as similarly shown in drawing 8 (C).

[0104] For this reason, at the following step 168, the biased degree by the side of the low concentration of the concentration distribution in the circumference field calculated at previous Step 166 judges whether it is more than a threshold. In addition, below, the judgment of Step 168 is called conditions h for convenience. The judgment of Step 168 corresponds to the thing according to claim 2 "for which the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field also takes into consideration and evaluates the accuracy as a field equivalent to the face of the person of a face candidate field on a picture."

[0105] Since it can judge that the face candidate field which incorporated data at Step 122 has high possibility that it is not the face field of a backlight scene when the judgment of Step 168 is denied, the judgment of being the face field of a backlight scene is stopped, and it shifts to Step 188. Moreover, when the judgment of Step 168 is affirmed, after substituting 1 for a flag at Step 134, it shifts to Step 136.

[0106] Thus, in the backlight scene judging processing concerning a \*\*\*\* 2 operation gestalt, it replaced with the conditions a and b explained with the 1st operation gestalt, and the face candidate field has judged whether it is the face field of a backlight scene based on each conditions of Conditions a, f, g, and h. and when the face candidate field with which are satisfied of each aforementioned conditions exists, (when the judgment of Step 138 is affirmation) Judge the picture of a processing object to be the picture of a backlight scene (Step 146), and the face candidate field which does not fulfill each aforementioned conditions is excepted (Step 147). The direction of top and bottom is judged based on the direction where the fuselage candidate field corresponding to the face candidate field which fulfills each conditions exists (Step 149). According to the adjustment degree of the direction where the fuselage candidate field to the degree of agreement and the direction of top and bottom to each conditions exists, weight mark are respectively set up to each face candidate field (Step 151).

[0107] Thereby, like backlight scene judging processing in which it explained with the 1st operation gestalt, the picture of a processing object is a picture of a backlight scene, and weight mark high only about the face candidate field which is equivalent to the face field of a backlight scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up.

[0108] Next, the stroboscope luminescence scene judging processing concerning a \*\*\*\* 2 operation gestalt is explained with reference to drawing 10. By this stroboscope luminescence scene judging processing, when the judgment of Step 180 is affirmed, the concentration contrast in a face candidate field and a fuselage candidate field (or saturation contrast) is respectively calculated at Step 202 (when the face candidate field fulfills Conditions c and Conditions d). And at the following step 204, it judges whether it is more than threshold Th2 (a threshold Th 2 is a high value beyond a predetermined value from the threshold Th 1 used for the judgment of Step 184 of the backlight scene judging processing concerning the 2nd operation gestalt) as which the contrast in a face candidate field and a fuselage candidate field was determined beforehand.

[0109] In addition, below, the judgment of Step 204 is called conditions j for convenience. The judgment of Step 204 also corresponds to the thing according to claim 1 "for which the accuracy as a field equivalent to the face of the person of a face candidate field is evaluated based on the contrast of the concentration in a face candidate field and the extracted fuselage candidate field, or saturation."

[0110] On the picture showing a stroboscope luminescence scene, while the contrast about the concentration in a face field (and saturation) becomes large, the contrast about the concentration in a fuselage field (and saturation) becomes large similarly. For this reason, since it can judge that the face candidate field which incorporated data at Step 122 has high possibility



that it is not the face field of a stroboscope luminescence scene when the judgment of Step 204 is denied, a face candidate field stops the judgment of being the face field of a stroboscope luminescence scene, and shifts to Step 188. Moreover, when the judgment of Step 164 is denied, after substituting 1 for a flag at Step 166, it shifts to Step 188.

[0111] Thus, in the stroboscope luminescence scene judging processing concerning a \*\*\*\* 2 operation gestalt, it replaced with the conditions c, d, and e explained with the 1st operation gestalt, and the face candidate field has judged whether it is the face field of a stroboscope luminescence scene based on each conditions of Conditions c, d, and j. and when the face candidate field with which are satisfied of each aforementioned conditions exists, (when the judgment of Step 190 is affirmation) The picture of a processing object is judged to be the picture of a stroboscope luminescence scene (Step 192). Except the face candidate field which does not fulfill each aforementioned conditions (Step 193), and the direction of top and bottom is judged based on the direction where the fuselage candidate field corresponding to the face candidate field which fulfills each conditions exists (Step 196). According to the adjustment d gree of the direction where the fuselage candidate field to the degree of agreement and the direction of top and bottom to each conditions exists, weight mark are respectively set up to each face candidate field (Step 198).

[0112] Thereby, like stroboscope luminescence scene judging processing in which it explained with the 1st operation gestalt, the picture of a processing object is a picture of a stroboscope luminescence scene, and weight mark high only about the face candidate field which is equivalent to the face field of a stroboscope luminescence scene though the field which is not a face field in fact is intermingled in a face candidate field can be set up.

[0113] In addition, you may make it change the weight mark P set as each face candidate field, the threshold THF for a face field judging, or the weight given to the concentration M of each face candidate field in the face field concentration Mface according to the kind of image processing performed using the processing result of face field extraction and concentration data processing.

[0114] For example, it sets to an image processor 40 using the extraction result of the face field by face field extraction and concentration data processing. Although it is dependent also on the grade of sharpness emphasis, or the kind of filter when sharpness emphasis processing in which the sharpness of a face field is emphasized covering an edge emphasis filter locally only to the extracted face field is performed Though emphasis of sharpness is performed also to the field which is not a face field in fact, a visual-sense top has a thing with a small (it is not conspicuous) bad influence. in such a case, threshold THF for a face field judging A value is made smaller than usual (namely, the criteria of selection of a face candidate field -- changing), and more face candidate fields may be made to judge to be a face field. Threshold THF for a face field judging Since the probability by which a misjudgment law is carried out will become low if the face candidate field corresponding to an actual face field is not a face field as a value is made low, by the above, it cannot leak to the face field in a picture, and sharpness emphasis processing can be performed.

[0115] Moreover, threshold THF for a face field judging More face candidate fields are able to replace with changing a value and to judge by what (that is, for the criteria of the evaluation to each face candidate field to be changed) the bigger value as weight mark P than usual is set up for to be a face field. Especially, as sharpness emphasis processing, when processing which strengthens the emphasis degree of sharpness is performed as the weight mark P become large, it also becomes possible to control the emphasis degree of sharpness strength by setting up the weight mark P as mentioned above.

[0116] Moreover, although it is dependent also on the grade of concentration amendment when amendment concentration amendment processing is locally performed in concentration for example, based on the face field concentration Mface only to the extracted face field using the extraction result of a face field and the face field concentration Mface by face field extraction and concentration data processing Though concentration amendment is performed also to the field which is not a face field in fact, a visual-sense top has a thing with a small (it is not conspicuous) bad influence. In such a case, threshold THF for a face field judging A value is



made smaller than usual and more face candidate fields may be made to judge to be a face field. Threshold THF for a face field judging Since the probability by which a misjudgment law is carried out will become low if the face candidate field corresponding to an actual face field is not a face field as a value is made low, by the above, it cannot leak to the face field in a picture, and concentration amendment processing can be performed.

[0117] Although the above-mentioned explanation is the case where an image processing with small influence is performed, in extraction of a face field when the field which is not a face field is accidentally extracted as a face field in fact conversely, when the image processing influenced [ great when the field which is not a face field in fact is accidentally extracted as a face field ] is performed For example, threshold THF for a face field judging Only the face candidate field where the accuracy as a face field is higher is able to be extracted as a face field by setting up the value smaller than usual as weight mark P in making a value larger than usual.

[0118] Moreover, the face field concentration  $M_{face}$  which can be found by previous (1) formula ((2) formulas are sufficient) also about face field concentration as shown, for example in the following (3) formulas Weighted-average-efficiency  $M_{face}'$  with other picture characteristic quantity D (for example, average concentration of the whole picture, average concentration of a non-face candidate field, etc.) When calculating however, (a weighting factor [ as opposed to the face field concentration  $M_{face}$  in  $\alpha F$  ] and a weighting factor [ as opposed to the picture characteristic quantity D in  $\alpha 0$  ]) as face field concentration, The kind of image processing performed using the calculated face field concentration is embraced, and it is weighting-factor  $\alpha F$  and  $\alpha 0$ . You may make it change the weight given to the concentration M of each face candidate field by what (that is, for the criteria of weighting to each face candidate field to be changed relatively) a value is changed for.

[0119]

$M_{face}' = \alpha F \cdot M_{face} + \alpha 0 \cdot D$  -- (3)

Moreover, although the above explained the case where calculated the processing conditions which include face field extraction and concentration data processing with the auto setup engine 44 based on press can image data, and the actual image processing to fine scan image data was performed by the image processor 40 It may be made to perform the image processing in the operation of processing conditions, and the calculated processing conditions in order not to the thing limited to this but to single image data, and may be made to perform these processings of a series of in the single processing section.

[0120] Furthermore, although extraction of a face field and the operation of face field concentration were respectively performed based on the weight mark set up to each face candidate field in the above, it is not limited to this and may be made to perform only either.

[0121] Moreover, although the image data obtained by reading the picture recorded on the photographic film above and the image data obtained by the image pick-up by the digital camera were made into the processing object, it is good also considering the image data obtained by reading the picture which is not limited to this and recorded on other record material, such as paper, or the image data generated by computer as a processing object. Moreover, this invention cannot be overemphasized by that the film picture recorded on the photographic film may be used for the determination of the exposure conditions at the time of carrying out exposure record by field exposure at printing paper.

[0122]

[Effect of the Invention] As explained above, a claim 1 and invention according to claim 4 Extract the face candidate field presumed, and equivalent to the face of the person in a picture, then when the concentration in a face candidate field is more than the 1st threshold or below the 2nd threshold A concentration difference with the face candidate field within the limits presumed that the field equivalent to the fuselage of the person who set up on the basis of the face candidate field exists The existence of the field below a predetermined value, Or since considerable, then the accuracy as a field which is equivalent to the face of the person of a face candidate field based on the contrast of the concentration in the fuselage candidate field presumed or saturation are evaluated on the inside of a face candidate field, and a person's fuselage When the concentration of the field equivalent to the face of the person in a picture is

deflecting to the high concentration or low concentration side, it has the outstanding effect that the field equivalent to a person's face can be judged with high precision.

[0123] In invention of a claim 1, when the concentration in a face candidate field is more than the 1st threshold, invention according to claim 2 The surface ratio of the field of each concentration region when dividing a picture into the field of the concentration region more than a three-stage, And since at least one side of the biased degree by the side of the low concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration and a face candidate field is evaluated It has the effect that the field equivalent to the face of the person who exists in the picture showing a backlight scene can be judged more to high degree of accuracy in addition to the above-mentioned effect.

[0124] In invention of a claim 1, when the concentration in a face candidate field is below the 2nd threshold, invention according to claim 3 Since the biased degree by the side of the high concentration of the concentration distribution in the field which exists in the circumference of a face candidate field on a picture is also taken into consideration and a face candidate field is evaluated It has the effect that the field equivalent to the face of the person who exists in the picture showing the scene which made the stroboscope emit light can be judged more to high degree of accuracy in addition to the above-mentioned effect.

[0125] That invention according to claim 5 is equivalent to the face of the person in a picture, then the 1st step which extracts the face candidate field presumed, When the concentration in a face candidate field is more than the 1st threshold or below the 2nd threshold A concentration difference with the face candidate field within the limits presumed that the field equivalent to the fuselage of the person who set up on the basis of the face candidate field exists The existence of the field below a predetermined value, Or it is based on the contrast of equivalent to the inside of a face candidate field, and a person's fuselage then the concentration in the fuselage candidate field presumed, or saturation. Since the program for making a computer perform processing containing the 2nd step which evaluates the accuracy as a field equivalent to the face of the person of a face candidate field was recorded on the record medium When the concentration of the field equivalent to the face of the person in a picture is deflecting to the high concentration or low concentration side, it has the outstanding effect that the field equivalent to a person's face can be judged with high precision.

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[Translation done.]

\* NOTICES \*

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the image processing system concerning this operation gestalt.

[Drawing 2] It is the flow chart which shows the content of face field extraction and concentration data processing.

[Drawing 3] It is the flow chart which shows the content of the backlight scene judging processing concerning the 1st operation gestalt.

[Drawing 4] It is the flow chart which shows the contents of the stroboscope luminescence scene judging processing concerning the 1st operation form.

[Drawing 5] It is the conceptual diagram showing the search line for searching the high concentration field which exists in the circumference of a face candidate field.

[Drawing 6] It is the diagram in which (A) shows the usual picture and (B) shows an example of a concentration distribution of the picture of a backlight scene respectively.

[Drawing 7] When the direction of top and bottom is strange, (B) of (A) is [ the conceptual diagram in which the direction of top and bottom shows respectively an example of the fuselage candidate area search range in the case of being known, and (C) ] the conceptual diagrams showing an example of the circumference field for a concentration distribution operation.

[Drawing 8] (A) is the diagram showing respectively an example of the concentration distribution in a background region [ in / the picture of a backlight scene / the usual picture and (B) and / in (C) ] in the picture of a stroboscope luminescence scene.

[Drawing 9] It is the flow chart which shows the content of the backlight scene judging processing concerning the 2nd operation gestalt.

[Drawing 10] It is the flow chart which shows the content of the stroboscope luminescence scene judging processing concerning the 2nd operation gestalt.

### [Description of Notations]

10 Image Processing System

14 Image Processing System

40 Image Processor

44 Auto Setup Engine

72 Information-Storage Medium

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[Translation done.]

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		(74) 代理人	100079049 井野口フイルム株式会社内 井野口 中島 淳 (外 3 名)	
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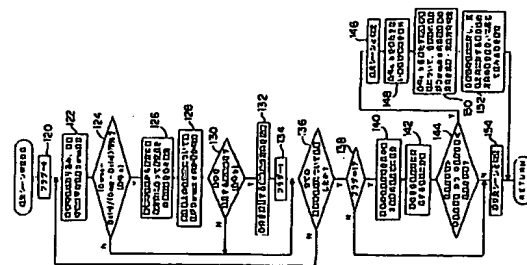
(54) 【発明の名称】 画像処理装置及び記録媒体

【57.】【塑料】

【解説】 画像中の人物の顔に相当する領域の濃度が高濃度側又は低濃度側に偏している場合にも、人物の顔に相当する領域を高濃度側に判定する。

【解説下段】人物の顔に相当すると推定される顔領域は、速度が低速側側に偏倚している(12)が骨関節のうち、速度が低速領域から高速域に及び、<sup>(1)</sup> 関節は正し、画像上で顔領域から四肢域に及びする要素を特定し、顔領域補完域のある者がそのα内の画像のみから成る探索域があるかを判定していた(125~130)。条件を満足する顔領域が存在していた場合には、画像を高速度/低速度・中間速度の各速度域の領域に分別し、中間速度領域の面積が他の領域の面積よりもより多い場合か判定する(140~144)。判定が肯定された場合には処理対象の画像を逆光シーンの画像と判定して迎光シーンの顔領域として利用した。

また、各種顔領域はそれぞれに速度範囲を設定する(146~152)ことで、



【指導要求の範囲】

【請求項1】 画像データに基づいて、該画像データが表す画像中の人物の顔に相当すると推定される顔候補領域を抽出し、

[illegible]

【用語説明2】 前記暖房補助域内の温度の絶対値又は前記画像全体にわたる前記暖房補助域内の温度の相対的な変化の割合以上の場合に、前記暖房補助域の温度が前記相当する温度として処理を、前記補助域の全領域の温度を3段階以上の温度域に分け暖房度を各温度域に分割したとき、各温度域の面積の面積比、及び前記画像上で前記暖房補助域の周囲に存在する領域内に存在する温度分布の低温度域への割合が大きいものとする。一方も考慮して処理することを特徴とする請求項1記載の画像処理方法。

【表註事項3】 前記候補者補選域内の選挙の地方執行は尚  
同画像全体の選挙に対する前記候補者補選域内の選挙の用  
意が完了した後に、前記候補者補選域内の選挙に於ける  
投票開始時刻から投票終了時刻までの間に、前記候補者補選域の  
一部の領域に相当する領域として、前記候補者補選域上  
で、前記候補者補選域の周囲に存在する領域内における選挙分  
割線と、前記候補者補選域の幅狭度側へ偏傾度合いも考慮して  
自然とする請求項1記載の画像処理方法。

【請求項4】 画像データに基づいて、該画像データが示す画像中の人物の顔に相当すると判定される顔候補領域を抽出する抽出手段と、

[illegible]

上に基づいて、前記隠微補償域の人物の顔に相当する顔を含む画像を抽出する。

【請求項5】 前記データに基づいて、該前記データが表す画像中の人物の顔に相当すると推定される顔候補領域を抽出する第1のステップ。

抽出した領域毎知識域内の速度の絶対値又は前記領域全体に於ける抽出した領域毎知識域内の速度の平均値が、第1の速度に比し又は前記第1の領域よりも所定値以上低い第2の速度域に於ける抽出した領域毎知識域内の速度の平均値が存在している」と判定された範囲における前記抽出した領域毎知識域内の速度の平均値として規定し、規定した範囲内における前記抽出した領域毎知識域とこの速度者が所定値以上の領域の無に基いて、前記領域毎知識域の人物の顔に相当する領域として規定し、範囲内で人物の顔に相当すると判定される領域毎知識域を抽出し、前記領域毎知識域内及び前記抽出した領域毎知識域内における速度又は速度のコントラス値に基づいて、前記領域毎知識域の人物の顔に相当する領域として規定し、この速度を制御する第2のステップを含む処理をコンピュータに実行させるためのプログラムが記述された記録媒体。

【発明の詳明】

【1666】

【本明の願する技術分野】本発明は画像処理方法、画像処理装置及び記録媒体に係り、特に、画像中の人物の顔面に相当すると推定される領域を抽出する画像処理方法、該画像処理方法を用いる可能な画像処理装置、及び前記画像処理方法をコンピュータで実行させるためのプログラムが記載された記録媒体に関する。

**[0002]**

[illegible]

【0003】このため、従来より、画像中の人物の顔に相当すると判定される領域を抽出するための手法が種々提案されている。例えば特開平8-134925号公報



当する新法は、人物の個体に相当する温度の領域を除くと、周囲の大部分が背景に相当する低温の新法に開かれていて、人物の顔に相当する領域の周囲に存在する領域内における温度分布は低温側側に偏倚する。

【0002】請求項2記載の発明では、逆光シーンを表す画像の上記特性を利用し、被検物補正域内の速度（絶対速度）が第1の閾値以上の場合、すなわち被検物補正域又は逆光シーンにおける人物の顔に相当する領域ではある可能性がある場合に、画像を3段階以上の速度域の順に分割したときの前速度域の面積比、及び画面上で被検物補正域の周囲に存在する領域内における速度分布の低速度側への偏傾度の少ないとも一方も考慮して、被検物補正域の顔に相当する領域としての精度を評価するので、逆光シーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定（或いは抽出）することができる。

【0021】なお、逆光シーンを表す画像は、両端中の人物に相当する領域の領域が低照度領域に属するとは、両端中の背景に相当する領域の領域は低照度領域に属するところから、画像全体の照度分布（照度ヒストグラム）が現れ、中間領域及び低照度領域に各ピーク（山）が現れ、中間領域域に谷が現れる形状となる。このため、前述の中間域に基づく判定に代えて、照度とストロガム形状に基づく判定を行うようにしてもよい。

【0022】請求項3記載の発明は、請求項1の発明において、前記臨界面領域内の速度の絶対値又は相対値が全体の速度に対する前記臨界面領域内の速度の相対値が、前記第2の面における場合と、前記臨界面領域の人物の面に相当する領域としての領域を、前記面と上で前記臨界面領域の両方に存在する領域における速度分布の傾向度側へ向う傾向度合いも考慮して評価することを特徴としている。

【0023】ストロボを発光させたシーンでは、画像中の人物に相当する領域が低速度側へ偏傾し、また画像中の背景に相当する領域は高速度側へ偏傾することが多い。このため、ストロボを発光させたシーンの画像を被写体中の人物の顔に相当する領域は、人物の顔に相当する低速度の領域を缺くこと、周囲の大部分が背景に相当する高速度の領域に囲まれていることが多く、人物の顔の周囲には高速度の領域が存在する領域内における速度分布は低速度側へ偏傾することが多い。

[illegible]

存在する人物の顔に相当する領域を、より高精度に判定  
(或いは抽出) することができる。

[illegible]

【0027】請求項5記載の発明に係る記録媒体には、上記の第1のステップ及び第2のステップを含む処理、すなわち請求項1の発明に係る画像処理方法に係る処理をコンピュータ1の実行させるためのプログラムが記録されている。ここで、コンピュータが前記プログラムを実行させているプログラムを読み出して実行することは、請求項1の発明と同様に、画面中の人物の姿に相当する。

領域の速度が高速度側又は低速度側に偏倚している場合にも、人物の顔に相当する領域を高速度に判定（或いは抽出）することができる。

【0028】  
【発明の実施の形態】以下、図面を参照して本発明の具  
体形態の一例を詳細に説明する。  
【0029】【第1実施形態】図1には、本発明が適用  
された商後処理システム10が示されている。商後処理  
システム10は、スキャナ12、商後処理装置14及び  
プリンタ16が直列に接続されて構成されている。

【0030】スキヤミ2は、写真フィルム(例えばネガフィルムやリバーサルフィルム)等の写真感光材料(以下に「写真フィルム」と称する)に記録されているフィルム画像(被写体を撮影後、現像処理をすることで可視化された被写体画像又は3次元像)を読み取り、該読み取りによって得られた画像データを出力するものである。光學むらから射出された光が、フィルムスキヤミ22に於いて、光學むらで減衰された光が、フィルムスキヤミ24にセツトされているネガフィルムやリバーサルフィルム等の写真フィルム26に照射され、写真フィルム26を透過した光がレンズ28を介してCCDセンサ30(エリアセンサであつてもラインセンサであつてもよい)の受光面上に結像するように構成されている。

【0031】フィルムキーマ24は、写真フィルム26上のフィルム面側が記録されている箇所が、長さ20mmからの増減の光軸上に現はれるように写真フィルム26の2枚を透過する。これにより、写像フィルム26に記録されているフィルム面側がCCDセンサ30によって順に読み取られ、CCDセンサ30からはフィルム面側に対する写像が出力される。CCDセンサ30からの出力された信号はA/D変換部32によってデジタル化され、後データメモリー28に格納されて画像データ装置14に出力される。

[illegible]

【0033】1/0コントローラ38の入力端は、イメージロセッサ40のデータ出力端にも接続されており、イメージロセッサ40からは画像処理（圧縮は後

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元)が行われた画像データが人力される。また、1/0  
コントローラ38の人力端はパーソナルコンピュータ4  
2にも接続されている。パーソナルコンピュータ42は、  
映像スロット(図示省略)を備えており、この映像スロ  
ットには、デジタルシミュラタ等によって画像データ  
が書き込まれたデジタルカメラカードに対してデータ  
の読み出し/書き込みを行うドライバ(図示省略)が接続され  
ている。映像スロットを介して外部からファイル画像データ  
(デジタルカメラカードから読み出した画像データ)が  
人力された場合、入力されたファイル画像データは1/  
0コントローラ38へ入力される。

【0034】I/Oコントローラ338の出力端は、イメージプロセッサ400のデータ入力端、ポートセットアップエンジン44、パーソナルコンピュータ42に各々接続されており、更にI/F回路54を介してプリンタ156に接続され、I/Oコントローラ33は、人力された画像データを、出力端に接続された商品各場景に意図的に出力する。

【0035】本実施形態では、写真フィルム26に記録されている画寸のフィルム10の露光に対し、スクリーン2に於いて異なる解像度の2画の露光が行われる。1画目の比較的低解像度の露光の取り（以下、プレスクリーンという）では、フィルム10の感度が非常に低い場合（例えば、ネガフィルムにおける露光アングラの平方関係）にも、CDDセンサ30で露光電流の検出が生じないことに決定した撮取条件（写真フィルム26に照射する光のR、G、Bの各波長域毎の光量、CDDセンサ30の電荷貯留時間）で写真フィルム26の全画の露光が行われ、このプレスクリーンによって得られたデータ（プレスクリーンデータ）は、1/0コントロール38からオートセッタップエンジン44へ入力される。

【0036】オーディオセットアップアプリケーション44は、CP  
U46、RAM48（例えばDRAM）、ROM50  
（例えば記憶内容を保持可能なROM）、入力ポート  
52を備え、これらがバスを介して互いに接続されて  
構成されている。オーディオセットアップアプリケーション44は、  
1ノコントローラ38から入力されたプレスキャンデー  
ータに基づいてフィルム側のコマ位置を判定し、写真  
フィルム26上のフィルム側データ領域に対してそのデー  
タ（プレスキャンデータ）に基づいて、フィルム側  
スキャン領域データに基づいて、フィルム側  
のサイズを判定すると共に感度等の画像品質を算出し、プレス  
キャンを行った写真フィルム26に対し、スキャン12  
が比較的高解像度での取像の品質を確保し、ファイ  
ンが比較的低解像度での取像の品質を決定する。そ  
してコマ位置及び採取条件をスキャン12に出力する。

【0037】また、オートセットアップエンジン44は、プレスキャン画像データ（又は低解像度化したファイル画像データ）に基づいて、画像中の要素部（例えば

11.  $\frac{1}{2} \ln \left( \frac{1 + \sqrt{1 - 4x}}{1 - \sqrt{1 - 4x}} \right) - \frac{1}{2} \ln \left( \frac{1 + \sqrt{1 - 4x}}{1 - \sqrt{1 - 4x}} \right) = 0$







いる。なお、顔候補領域内の顔度の相対値に代えて顔候補領域内の顔度の絶対値を用い、該顔度の絶対値を所定値(第2の閾値)と比較することにより判定を行うようにしてもよい。

【0075】ステップ174の判定が否定された場合には、顔候補領域内の顔度が低閾値側に偏在していないの状態で、ステップ172でデータを取り込んだ顔候補領域は、ストロボ発光シーンの顔候補ではないと判断でき、ステップ174の判定が否定された場合には、ストロボ発光シーンの顔候補が否かの判定を中止し、ステップ186へ移行する。

【0076】一方、ステップ174の判定が肯定された場合にはステップ176へ移行し、処理対象の画像に対して、人物の顔に相当する顔候補領域を探索するため、探索範囲を設定する。なお、顔候補領域の探索範囲としては、例えば顔候補領域と中心位置が一致する(円形状でも矩形でもよい)の領域を設定することによって、図7(A)には円形状の領域を示す)、探索範囲の大きさは顔候補領域の大きさが大きくなるに従って大きくなるように定めることができる。また、処理対象の画像の天地方向が既知であるならば、顔候補に対して顔候補が存在している可能性がある方向が限定されるので、天地情報に基づき顔候補領域から見て顔候補領域が存在している可能性のある方向におき探索範囲が分布するように探索範囲を設定することができる(例として図7(B)参照)。

【0077】上記のように探索範囲を設定すると、ステップ177では設定した探索範囲内で顔候補領域を探索する。顔候補領域の探索は、例えば特開平8-184925号公報に記載されているように、探索範囲内で人物の顔の輪郭を特徴形状パターンを探索し、検出した形状パターン(例えば、向き、検出した形状パターンと顔候補領域との位置関係)に基づいて、人物の顔に相当する顔候補としての候補性を判定することを行うことができる。また、顔候補の輪郭を若干形状パターンの探索に際しては、特開平9-135471号公報に記載の特定形状特徴抽出方法等の公知技術を用いてもよい。

【0078】次のステップ178では、上記の顔候補領域の探索により、顔候補領域と判断できる領域があったか否か判定する。判定が否定された場合には、ステップ172でデータを取り込んだ顔候補領域は、ストロボ発光シーンの顔候補ではないと判断できるので、顔候補領域がストロボ発光シーンの顔候補が否かの判定を中止し、ステップ186へ移行する。また、ステップ178の判定が肯定された場合にはステップ180へ移行し、顔候補領域の探索によって抽出された顔候補領域内の平均顔度を算出し、顔候補領域内の平均顔度D<sub>area</sub>と、顔候補領域α以内の平均顔を判定する。

【0079】なお、以下ではステップ180の判定を便宜的に条件dという。ステップ180の判定は、請求項

1に記載の「画像中の人物の顔に相当する領域が存在している」と判定される範囲(顔候補領域の探索範囲)内における顔候補領域との顔度差が所定値以下の領域(条件eを満たす顔候補領域)の有無に基づいて、顔候補領域の人物の顔に相当する領域としての顔度を評価することに対応している。

【0080】ストロボ発光シーンを表す画像では顔候補領域と同様に顔候補領域の顔度と低閾値側に偏在する。このため、ステップ180の判定が否定された場合には、処理対象の画像をストロボ発光シーンの画像と仮定すると、抽出した顔候補領域は人物の顔に相当する領域ではない可能性が高いと判断できるので、ストロボ発光シーンの顔候補が否かの判定を中止し、ステップ186へ移行する。また、ステップ180の判定が肯定された場合にはステップ182へ移行し、顔候補領域を基準として顔候補領域の周囲に存在する画像中の背景に相当すると判定される領域(周囲領域)を設定し(例として図7(C)参照)、設定した周囲領域内における顔度分布を算出する。

【0081】ここで、通常の画像(非逆光でストロボを発光させないシーンを表す画像)では、画像中の背景に相当する領域の顔度分布(顔度ヒストグラム)は、例として図8(A)に示すように、顔全体を顔度の中央よりも若干高顔度側に偏在した位置にピークが現れる形状となる。これに対し、ストロボ発光シーンを表す画像における背景領域の顔度分布(顔度ヒストグラム)は、例として図8(B)にも示すように、ピークの位置が極端に高顔度側に偏在した形状となる。この場合とある。顔候補領域がストロボ発光シーンの顔候補である場合、前述の周囲領域は図7(C)にも示すように人物の顔に相当する低顔度領域を一部含むことになるが、該領域が周囲領域に占める面積は小さいので、顔度分布は同様に図8(B)に示すような形状となる。【0082】このため、次のステップ184では、先のステップ182で算出した周囲領域内における顔度分布のおおまかな顔度分布の傾向(例えば、顔度分布のピーク位置の傾向)を、高顔度側からの累積度数が所定値となったときの顔度値等を用いて表すことができる。ステップ184の判定は、請求項3に記載の「顔候補領域の人物の顔に相当する領域としての顔度を、画像上で顔候補領域の周囲に存在する領域内における顔度分布の高顔度側の傾向(例えば、高顔度側からの累積度数)に基づいて判定すること」に対応している。

【0083】ステップ184の判定が否定された場合には、ステップ172でデータを取り込んだ顔候補領域は、ストロボ発光シーンの顔候補ではない可能性が高いと判

断できるので、ストロボ発光シーンの顔候補が否かの判定を中止してステップ186へ移行する。また、ステップ184の判定が肯定された場合にはステップ186へ移行し、フラグに1を代入してステップ188へ移行する。

【0084】ステップ188では、顔候補領域抽出処理(ステップ100)によって抽出された全ての顔候補領域に対してステップ172以降の処理、判定を行ったか否か判定する。判定が否定された場合にはステップ172に戻り、前記判定が肯定される迄ステップ172～188を繰り返す。これにより、全ての顔候補領域に対してストロボ発光シーンの顔候補が否か各々判定されることになる。そして、ステップ188の判定が肯定されるとステップ190へ移行する。

【0085】ステップ190ではフラグが1か否か判定する。ステップ190の判定が否定された場合には、条件c(ステップ174の判定)、条件d(ステップ180の判定)及び条件e(ステップ184の判定)を満たす顔候補領域が存在していないので、処理対象の画像はストロボ発光シーンを表す画像ではないと判断できる。このため、ステップ200で処理対象の画像は非ストロボ発光シーンを表す画像と判定し、ストロボ発光シーンの判定処理を終了する。

【0086】一方、ステップ190の判定が肯定された場合には、条件c、条件d及び条件eを各々満足する顔候補領域が存在しているためステップ192へ移行し、処理対象の画像はストロボ発光シーンを表す画像と判定する。次のステップ194では、顔候補領域抽出処理によって抽出された顔候補領域の中に、条件c、条件d及び条件eの各条件を満たさない顔候補領域があれば、該領域は顔候補領域から除外する。

【0087】ステップ196では、前記条件を満たす顔候補領域(ステップ194で除外されなかった顔候補領域)に対し、各顔候補領域に対して各々抽出した顔候補領域の顔度と低閾値との差を比較し、顔度の天地方向を判定する。この判定は、例えば顔候補領域の存在している方向が同一の顔候補領域の数を各方向別に算出し、顔候補領域の数が最多の方向を天地方向と判定することを行うことができる。

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i) / \sum_{i=1}^N P_i, \quad \dots (1)$$

$$M_{face} = \sum_{i=1}^N (M_i \cdot P_i \cdot S_i) / \sum_{i=1}^N (P_i \cdot S_i), \quad \dots (2)$$

【0092】

【0093】

【0093】但し、iは各顔候補領域を識別するための符号、Nは顔候補領域の総数、M<sub>i</sub>は顔候補領域iの顔度、P<sub>i</sub>は顔候補領域iの重み係数、S<sub>i</sub>は顔候補領域iの面積である。

【0094】(1)式及び(2)式より明らかのように、顔候補領域M<sub>face</sub>は各顔候補領域の顔度Mの加重平

【0088】そして、次のステップ198では、各顔候補領域に対し、ステップ196で判定した天地方向に対する顔候補領域の存在している方向の割合を算出(例えば、各顔候補領域の周囲領域内における顔度の平均値)や、各顔候補領域の周囲領域内における顔度の分布の傾向(例えば、高顔度側からの累積度数)を算出する。なお、この算出は顔候補領域の人物の顔に相当する領域としての顔度を算出する処理に対応しており、ステップ152はステップ174、180、184の判定と共に請求項4に記載の顔度算出処理に対応している。

【0089】上記のストロボ発光シーンの判定処理により、処理対象の画像がストロボ発光シーンの画像であり、顔候補領域の中に天候には顔候補領域ではない領域が存在しているとしても、ストロボ発光シーンの顔候補に相当する顔候補領域についてのみ高い重み係数を算定することができる。ステップ198の処理を行うストロボ発光シーンの判定処理を終了し、図2のフローチャートのステップ108へ移行する。

【0090】ステップ108では、上述したストロボ発光シーンの判定処理において、処理対象の画像がストロボ発光シーンを表す画像と判定されたか否か判定する。判定が肯定された場合にはステップ112へ移行する。また、判定が否定された場合は、顔候補領域の画像が逆光シーンを表す画像ではなく、ストロボ発光シーンを表す画像であると判定された場合には、ステップ110において、各顔候補領域に対し、顔候補領域の人物の顔に相当する領域としての顔度を算出する処理を従って算出する。詳細計算に依りて各顔候補領域に重み係数を算定する。

【0091】ステップ112では、各顔候補領域の重み係数Pを顔度判定用の顔度Mと各々比較し、重み係数Pが閾値T<sub>H</sub>以上の顔候補領域を顔候補として抽出(選択)する。また、次のステップ114では、次の(1)式又は(2)式に従って処理対象の画像の顔度と顔度M<sub>face</sub>を算出し、顔度抽出・顔度算出処理を終了する。

【0092】

【0093】

均値であり、(1)式では各顔候補領域の重み係数Pに基づいて各顔候補領域の重み付けしており、(2)式では重み係数P及び前報Sに基づいて各顔候補領域の重み付けしている。

【0095】上記の顔度抽出・顔度算出処理を行うと、オートセットアップエンジン44は、更に、イメー



されるようにしてもよい。顔領域判定用の閾値 $T_H$ の値を低くすると従って、実際の顔領域に判定される領域が低くなるので、顔領域が顔領域でない領域として判定される領域が低くなる。以上により、画像中の顔領域に対して低くなくシャープネス強調処理を施すことができる。

【0115】また、顔領域判定用の閾値 $T_H$ の値を変更することによって、重み点 $P$ として通常よりも大きな値を設定する（すなわち各顔領域補正域に対する評価の基準を変更する）ことで、より多くの顔領域補正域が検出され判定されるようになることも可能である。特にシャープネス強調処理として、重み点 $P$ が大きな値となるに従ってシャープネスの強調度合いを強くする処理が行われる場合には、重み点 $P$ を上記のように設定することでシャープネスの強調度合いを強めにコントロールすることも可能となる。

【0116】また例えば、顔領域抽出・速度補正処理による顔領域の抽出結果及び顔領域速度 $M$ faceを利用し、抽出された顔領域に対してのみ顔領域速度 $M$ faceに基づき局所的に速度を補正する速度補正処理が行われる場合、速度補正の程度にも依存するが、実際には顔領域でない領域にも速度補正が行われたとしても視覚上は感度（つまり目立たない）ことがある。このような場合には、顔領域判定用の閾値 $T_H$ の値を通常よりも小さくし、より多くの顔領域補正域が検出され判定されるようにしてもよい。顔領域判定用の閾値 $T_H$ の値を低くすると従って、実際の顔領域に判定される顔領域補正域が顔領域 $M$ face' =  $\alpha_r \cdot M$ face +  $\alpha_o \cdot D$  となる。

また、上記ではブレスクアン画像データに基づきオートセットアップエンジン44によって顔領域抽出・速度補正処理を含む処理条件の算出を行い、ファインズキャン画像データに対する実際の顔領域処理はイメージプロセッサ40で行う場合を説明したが、これに限定されるものではなく、単一の画像データに対して処理条件の算出、算出した処理条件での顔領域処理を行うようにしてもよく、これらの一連の処理を単一の処理で行うようにしてもよい。

【0120】更に、上記では各顔領域補正域に対して設定した重み点 $P$ に基づき、顔領域の抽出及び顔領域速度の算出を行っていたが、これに限定されるものではなく、何れか一方のみを行うようにしてもよい。

【0121】また、上記では写真フィルムに記録された画像を読み取ることで得られた画像データを処理対象メタラによる画像によって得られた画像データを処理対象としていたが、これに限定されるものではなく、感写剤他の記録材料に記録された画像を読み取ることで得られた画像データ、或いはコンピュータによって生成された画像データを処理対象としてもよい。また、本発明は写真フィルムに記録されたフィルム画像を顕微鏡により印刷媒体に感光記録する際の露光条件の決定に利用してもよいことは言うまでもない。

領域でない」と誤判定される確率が低くなるので、上記により、画像中の顔領域に対して低くなく速度補正処理を施すことができる。

【0117】上記の説明は、顔領域の抽出において、実際には顔領域でない領域を通過して顔領域として抽出した場合にも影響が小さい画像処理が行われる場合であるが、逆に実際には顔領域でない領域を誤って顔領域として抽出した場合には、例えば顔領域判定用の閾値 $T_H$ の値を通常よりも大きくしたり、重み点 $P$ として通常よりも小さな値を設定することで、顔領域としての領域がより少ない顔領域補正域のみが顔領域として抽出されるようになることも可能である。

【0118】また、顔領域速度についても、例えば次の(3)式に示すように、先の(1)式((2)式)よりもいいて求めた顔領域速度 $M$ faceと、他の画像特徴量 $D$ （例えば画像全体の平均勾配、非顔領域補正域の平均速度等）との加重平均値 $M$ face'（但し、 $\alpha_r$ は顔領域速度 $M$ faceに対する重み係数、 $\alpha_o$ は画像特徴量 $D$ に対する重み係数）を利用して算出する場合、算出した顔領域速度を利用して行われる画像処理の特性に応じて、各顔領域補正域の速度 $M$ に付与する重みを変更するようによりよい。

$$M$$
face' =  $\alpha_r \cdot M$ face +  $\alpha_o \cdot D$

... (3)

【0122】【発明の効果】以上説明したように請求項1及び請求項4記載の発明は、画像中の人物の顔に相当すると推定される顔領域補正域を抽出し、顔領域補正域内の速度が第1の閾値以上又は第2の閾値以下の場合には、顔領域補正域を基準として判定した人物の顔に相当する領域が存在しているとして判定される範囲内における顔領域補正域との速度差が所定値以下の領域の有無、又は顔領域補正域内及び人物の顔に相当すると推定される顔領域補正域内における速度又は速度のコントラストに基づいて、顔領域補正域の人物の顔に相当する領域としての速度を評価するので、画像中の人物の顔に相当する領域の速度が所定値又は低速度側に偏傾している場合にも、人物の顔に相当する領域を高精度に判定できる、という優れた効果を有する。

【0123】請求項2記載の発明は、請求項1の発明において、顔領域補正域内の速度が第1の閾値以上の場合に、画像を3段階以上の速度域の領域に分割したときの各速度域の領域の面積比、及び画像上で顔領域補正域の周囲に存在する領域内における速度分布の低速度側への傾度（傾度）の少なくとも一方も考慮して顔領域補正域を評価するので、上記効果に加え、逆光シーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定

することができ、という効果を有する。

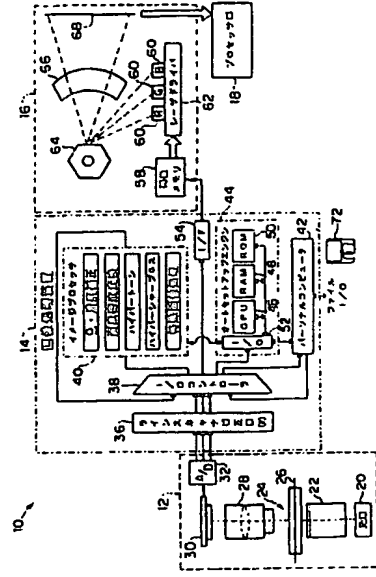
【0124】請求項3記載の発明は、請求項1の発明において、顔領域補正域内の速度が第2の閾値以下の場合に、画像上で顔領域補正域の周囲に存在する領域内における速度分布の低速度側への傾度（傾度）を考慮して顔領域補正域を評価するので、上記効果に加え、ストロボを発生させたシーンを表す画像中に存在する人物の顔に相当する領域を、より高精度に判定することができ、という効果を有する。

【0125】請求項5記載の発明は、画像中の人物の顔に相当すると推定される顔領域補正域を抽出する第1のステップ、顔領域補正域内の速度が第1の閾値以上又は第2の閾値以下の場合には、顔領域補正域を基準として判定した人物の顔に相当する領域が存在しているとして判定される範囲内における顔領域補正域との速度差が所定値以下の領域の有無、又は顔領域補正域内及び人物の顔に相当する領域の有無、又は顔領域補正域内における速度又は速度のコントラストに基づいて、顔領域補正域の人物の顔に相当する領域としての速度を評価する第2のステップを含む処理をコンピュータに実行させるためのプログラムを記録した記憶媒体に記録したので、画像中の人物の顔に相当する領域の速度が低速度側又は低速度側に偏傾している場合にも、人物の顔に相当する領域を高精度に判定できる、という優れた効果を有する。

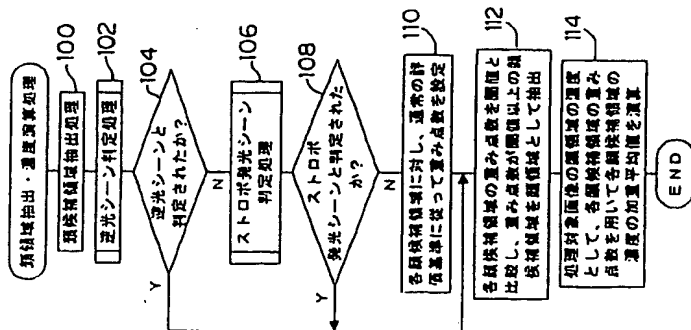
【図面の簡単な説明】

【図1】本実施形態に係る画像処理システムの概略構成図である。

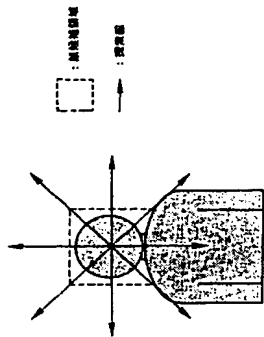
(101)



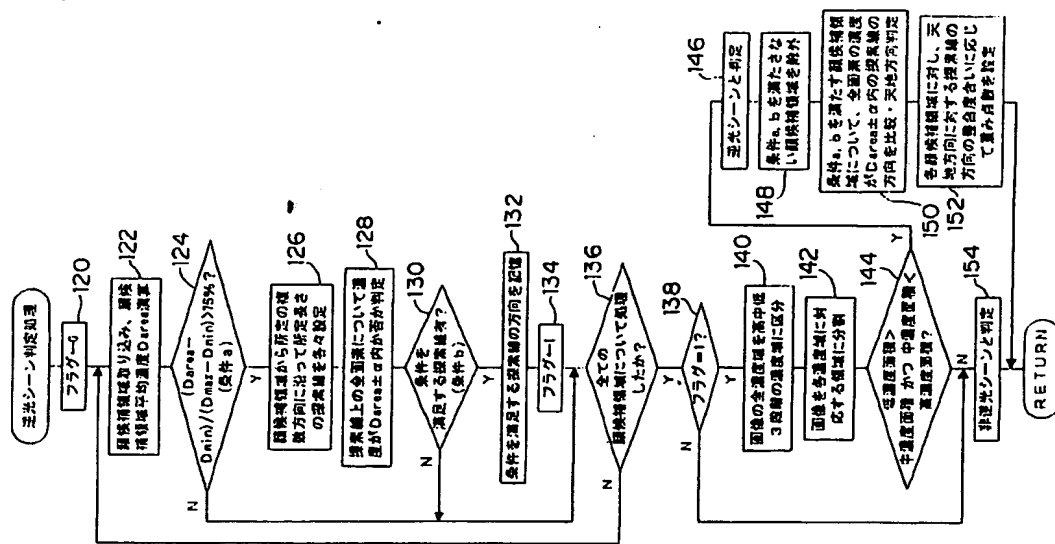
【図2】



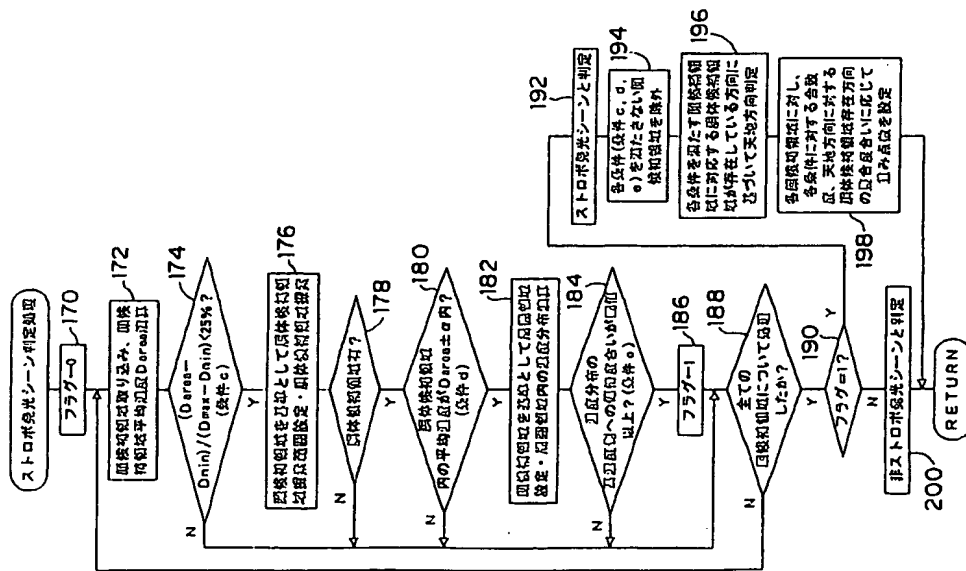
【図5】



【図3】

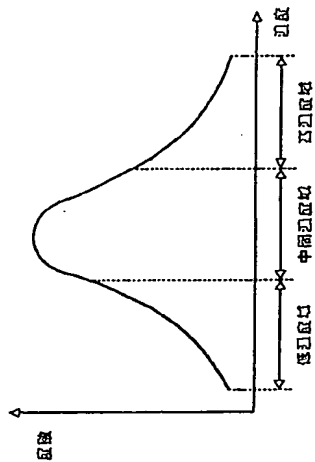


【図1】

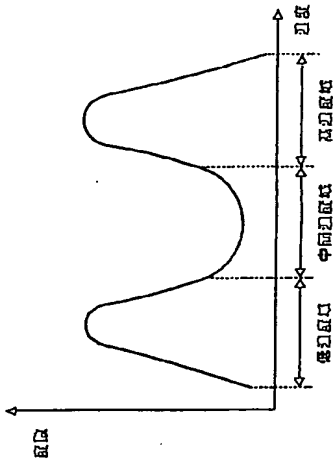


【図6】

(A) 通常の面長の刃物分布(刃長ヒストグラム)

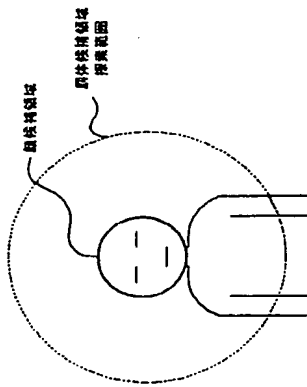


(B) 刃先シーンの刃物の刃長分布(刃長ヒストグラム)

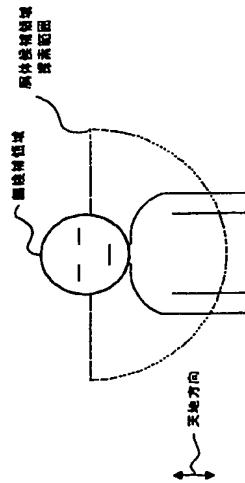


【図7】

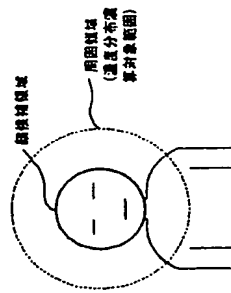
(A) 天地方向が未知の場合の周体候補領域探索範囲



(B) 天地方向が既知の場合の周体候補領域探索範囲

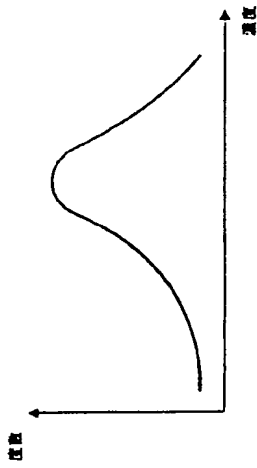


(C) 速度分布履歴列象の周体候補

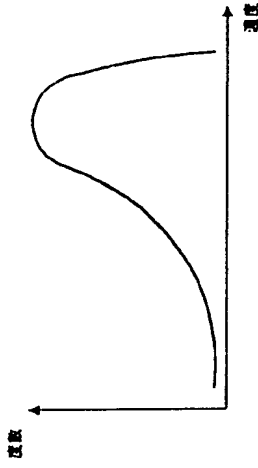


【図8】

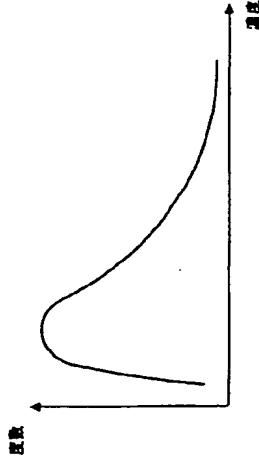
(A) 通常の画像における背景領域の速度分布(速度ヒストグラム)



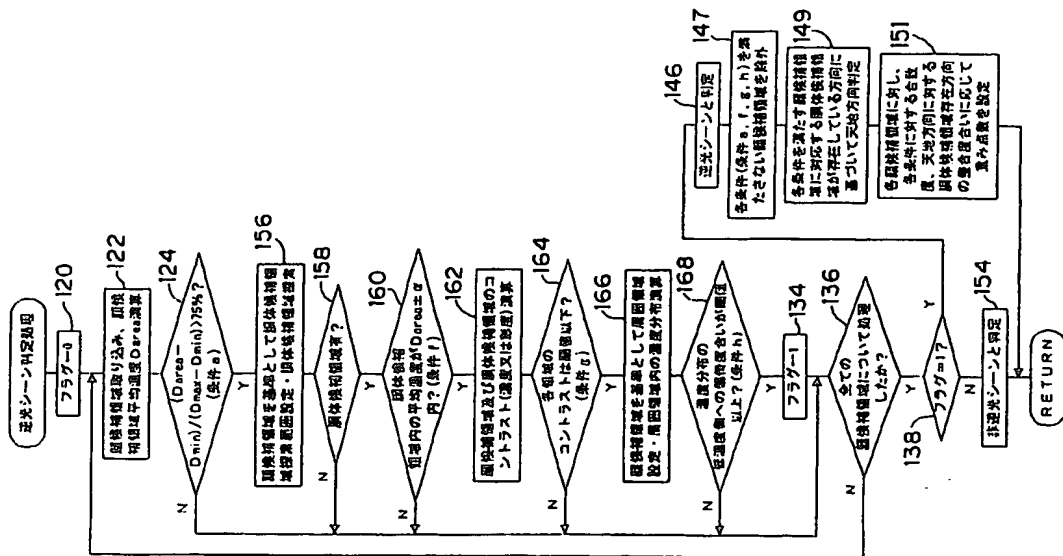
(B) ストロボ光撮影シーンの画像における背景領域の速度分布(速度ヒストグラム)



(C) 逆光シーンの画像における背景領域の速度分布(速度ヒストグラム)



【図9】



【図10】

